The American Journal of School Hygiene

A quarterly publication devoted to the interests of educational hygiene in the public schools of the United States

VOL. II MARCH, 1918 NO. 1

LAWRENCE AUGUSTUS AVERILL, *Editor*
Head of the Department of School Hygiene and Educational Psychology in the Massachusetts State Normal School at Worcester, Massachusetts

Contributing Editors

WILLIAM H. BURNHAM
Professor of Pedagogy and School Hygiene, Clark University

FLETCHER B. DRESSLAR
Professor of School Education
George Peabody College for Teachers

LEWIS M. TERMAN
Professor of Education
Leland Stanford Junior University

LUTHER H. GULICK
Director of the Department of Public Recreation
C. -E. A. WINSLOW
Director of Practical Training for the Department of Education of the City of New York

CONTENTS

The American Journal of School Hygiene
WORCESTER, MASSACHUSETTS

Published quarterly, on March 1st, June 1st, September 1st and December 1st. Office of Publication, Worcester, Massachusetts. Application for entry as second class matter at the Worcester, Massachusetts, post office, pending.
Terms: $2.00 per annum, postage in advance; single numbers 50 cents.
Copyright, 1918, by Lawrence Augustus Averill.
All communications should be addressed to the Editor, Worcester, Massachusetts.

THE AMERICAN JOURNAL OF SCHOOL HYGIENE

LAWRENCE AUGUSTUS AVERILL, *Editor*
WORCESTER, MASSACHUSETTS

CONTENTS OF VOLUME II
1918

AUTHOR'S INDEX

The American Journal of School Hygiene

VOL. II MARCH, 1918 No. 1

PUBLISHED QUARTERLY, IN MARCH, JUNE, SEPTEMBER AND DECEMBER

SPECIAL NOTICE TO PERSONS INTERESTED IN THIS PUBLICATION:

This JOURNAL is privately financed by the editor, and until it becomes self-supporting, it is requested that contributors and publishers shall accept and support the following terms:

To Contributing Editors: It is hoped that every Contributing Editor—and the list will be enlarged from time to time—will be active in supplying reviews or summaries of books and articles which may appear in the field. They will continue to receive complimentary copies of the JOURNAL, as heretofore.

To other contributors: It is suggested that articles submitted for examination contain, except in rare instances, not over 4500 to 5000 words. The costs of any cuts will be borne by the contributor, together with whatever charges are incurred by re-writing or re-casting proof sheets to the extent that re-setting is found necessary. Three copies of the JOURNAL containing his article will be furnished each contributor, but all complimentary subscriptions are hereby discontinued. Reprints or extra copies will, whenever desired, be supplied at cost.

To Publishers: The JOURNAL will be pleased to receive copies of books and monographs dealing with relevant topics. All such publications will be mentioned by title, and the more important of them will be reviewed. Clippings of any book notices given will be forwarded within 10 days to publishers.

To Reviewers of Books: It is desirable that all reviews represent the findings or recommendations of the author. We must discourage the type of review which is in reality merely a series of comments on the part of the reviewer. As far as possible the author's language should be used, and his chief conclusions stated as accurately and sympathetically as possible. At the end, the reviewer may feel quite free to add his own reaction or criticism.

To Publishers of Other Journals in Allied Fields: We shall be pleased to add to our list of domestic and foreign exchanges a limited number of publications representing our field.

To All: Owing to the unusual market conditions and the consequent abnormal cost of maintaining a publication of this nature, we urge that all persons who are or may be in any way connected with the JOURNAL will endeavor faithfully to co-operate with us in these matters.

All communications, reviews, articles, subscriptions, etc., should be addressed to Dr. Lawrence A. Averill, *Editor,*

The American Journal of School Hygiene

Massachusetts State Normal School, Worcester, Massachusetts.

STANDARD MEASUREMENTS FOR SCHOOL CHILDREN*

BY JAMES KERR, M. A., M. D., R. A. M. C., *London*

The first statement on health in the series of Reports which deal with the conditions of school life in the Metropolis, that "We have no trustworthy measurements of the development of London school children," is still true. Since that was written, millions of measurements have been recorded from all localities, without result nationally or individually commensurate with the time and labour expended. The recording of heights and weights are as valueless as meaningless unless referred to some kind of a standard, and no standard exists.

GENERAL CONSIDERATIONS

Certain conventions require recognition. The convention in most need of standardizing is the age group. Figures are given for a certain age, but it is often impossible to say whether they express measurements for the value at the birthday, or the group age last birthday, or for the nearest birthday.

*An address at the annual meeting of the Medical Officers of Schools Association, Dec. 4, 1917.

When using yearly intervals the commonest convention is to adopt age last birthday as the basis of classification. *Age last birthday should be the foundation for all school annual age groups when measurements are taken.* Age in years and months can nearly always be recorded. As a practical statement the height of boys of 13 should mean the average height of the annual group whose age last birthday was 13—. No other meaning should ever be attached to the figures, without a special qualification. It should be written or printed 13—, with a dash as in the Registrar General's Tables.

The theoretical heights, deduced from tables or graphs, as the height on the thirteenth birthday, are often convenient to use as exact statements, and should be spoken of as height at 13, and written 13., with a point after it to indicate the exact date.

Without attention to such conventions many tables and statements are indefinite and cannot be used for comparison later.

Often with groups of children, classed as entrants, specials, or leavers, there is a tendency to irregular distribution through the year of age which must be guarded against by noting the average age of the group. A method found in some sanitary Reports of aggregating the heights and dividing by the number of children may in such a case give erroneous results. One instance where for an English seaside town this method gave the height of nearly 1000 boys in their sixth year (*i. e.,* aged 5—,) as 103.7 cm., but half yearly groups printed elsewhere in the Report showed this value to be not less than 104.3 cm., furnishes evidence of a very substantial increase on the result as set out by the aggregate method.

PURPOSE OF MEASUREMENTS

The purpose of general weighing and measuring appears to have departed from its original intention of obtaining data for standards, and to have been widely extended and continued, in Great Britain at least, with the vague idea of somehow benefitting the individual from utility as a measure of nutrition or otherwise.

Height is generally felt to express conditions of heredity, whereas weight rather expresses environmental changes. This is roughly true. Height is a much less variable measure than weight, therefore presumably less liable to alteration by accidents of environment, so that any considerable variations suggest deeply placed causes of change. Robertson points out that the weight being more variable is a more sensitive indicator of the effects of

environment, and to be preferred as a test of dietetic or other changes, over stature, whose variations go far back in the life history.

RESULTS OF MEASUREMENTS

Race, however, is the main factor in height. The average English elementary school boy is considerably above the average Japanese boy of the same age, but in the Rhondda Valley the averages of the children fall below the Japanese. The following table, only including groups exceeding 500 in numbers, shows this in centimetres.

Elementary School Boys	5—6	6—7	7—8	12—13	13—14	14—15
English, Tuxford and Glegg	103.0	108.0	114.7	139.8	142.5	147.1
Japanese, Mishima	102.8	108.3	113.8	135.2	141.5	146.3
Rhondda Valley	100.9	105.8	111.3	134.1	139.1	------

This matter of race however is not the only feature modifying stature, as wherever examined the height attained also varies with the social class. Even in London, where however other selection may also come in, Jacobs states that the West End Jew averages nearly three inches more than his East End Kinsman. In the secondary schools year by year the children, as shown later, are taller than corresponding groups in elementary schools, and again elementary scholars in better districts socially show growth greater than in poorer schools. It is probable that the comparison of schools in different towns or districts nearly always fails in respect to social conditions not being allowed for, or equalized.

The kind of variation can be found by taking indiscriminately from Reports the average heights of boys in their thirteenth year. Here are found variations in Great Britain, for instance, for boys of thirteen from 138.5 in the Poorest Schools of Glasgow to 151.4 for Public School boys, in which social condition seems the main factor.

Again by height is meant the total height, which is made up of height of head, of body, and of length of legs. This last is the most variable element, and all these vary at different ages.

VARIATIONS IN HEIGHT MEASUREMENTS

The so-called standards of height are merely averages, which can in no sense be regarded as standards for comparison as they

include indiscriminately all classes of children, the only thing in common being sex and age. As an example, the tables from hundreds of thousands of measurements by various observers collected by Tuxford and Glegg express nothing but figures derived from arithmetic. The children are probably not represented in these tables in the proportion in which they exist either in school or in the general population. Internal evidence, noted later, suggests that selection makes them misleading above the age of eleven. Not only would more be measured in towns than country, but there was no exclusion of deformed or diseased, sufficient to obtain anything like a healthy average.

The marked effect on height of rickets for instance would probably be over represented instead of being absent from this table. These effects are well shown in figures for heights derived from the 1914 Report for Aberdeen.

HEIGHTS OF ENTRANTS. ABERDEEN, 1914

Average Age	Numbers	Percentage of Ricketty	Heights in Centimetres			
			Non-Ricketty	Ricketty		
				Beaded ribs only	and enlarged bone ends	and def'rmity of long bones
Boys 5½12	1914	39.9%	105.4	101.3	98.0	95.0
Girls 5½12	1828	34.2%	103.6	100.3	97.3	94.0

If it is remembered that in addition to rickets roughly 25 per cent of elementary school children show some scoliosis and also, especially in children who work industrially, some flatness of feet, the necessity for a rigorous selection of standard children is demonstrated.

EARLY ENVIRONMENT

Many years ago Dr. C. J. Thomas in a study of children in Southwark pointed out that it is necessary to look far back in the life history for the causes of poor physique, as where the parents are reported to have sunk from a higher stratum of the community the children are usually of excellent physique compared with the aboriginal denizens of the neighbourhood, and he

might have added that this probably throws some light on the alleged good physique of the drunkard's child. He found also that the children born in a year when the infantile mortality was low showed an increased physique in stature, and those born in years of high mortality a decreased physique. Curves of heights for ages, and infant mortality for the corresponding years of birth show a close but inverse correspondence. From this he concluded that the year of birth should be noted by those engaged on anthropometric surveys.

Combe noted that Lausanne children born in the winter months were distinctly smaller at their birthdays than those born in the summer months at corresponding ages.

Mumford, in his study of the past thirty years scholars, finds that "of every 100 boys at the Manchester Grammar School who are retarded one year or more in their work, 83 per cent show evidence of damaging disease in early infantine life." He shows that physique as estimated by height and weight of the present generation is better than at corresponding ages thirty years ago. His results are confirmed by observations from Marlboro', Rugby and other Public Schools. There is no doubt about the improvement in physique as shown by heights.

The increase in height appears to be generally noted. Parsons, from examination of thigh bones, concluded that the Midland Englishman of the thirteenth to the fifteenth century had an average height of 167.0 cm. (65.75 inches), and the British Association averaged English height as 171.5 cm. (67.5 inches). It is quite probable that there was a considerable fall in the first half of last century from effects of industrialism on the young, but there is no doubt about there being a gain going on now.

But measurements of skeletons over long periods show no very great change in stature; indeed it is to be remembered that the remains of a race have been found in the Mediterranean Riviera who flourished about 250 centuries ago and had an average stature of 180 cm. (6 ft. 1½ in.)

Probably the recent general increase is mainly due to avoidance of many effects of urbanization, less illness, better hygiene and the good feeding resulting from free trade.

STATURE AND INTELLIGENCE

Another point noticed by every invesitgator who attends to school hygiene beyond mere routine recording, is the relation of stature and intellectual accomplishment.

If the children of a definite year group be taken, and separated out by their school classification, into standards, grades, or classes representing academic and presumably intellectual status, the children of higher intellectual level, although of the same calendar age, will be of greater average height than those of lower school attainments. This also holds in some degree for other than children, for instance, in the British Association enquiry, the tallest class of the community, apart from any selection by height as for guardsmen, was found to be Fellows of the Royal Society. American observers first noted these relations of stature and intelligence, and they were equally recorded in the first enquiry in London schools.

Taking ten, eleven, and twelve-year-old groups of girls, the average heights in centimetres for each year in each school class can be shown in the following table:—

St. Louis Grades		3	4	5	6	7
St. Louis	10's	130.8	134.0	134.7	136.4	------
Porter's	11's	133.6	136.0	137.6	139.0	140.9
Report	12's	------	142.0	144.5	143.3	145.9
London Standards		**III**	**IV**	**V**	**VI**	**VII**
Report 1906	10's	129.2	132.4	133.5	135.1	------
	11's	131.1	135.8	138.7	138.9	145.0
	12's	135.7	139.7	140.8	145.1	145.4

The American writers point out that the children who are retarded in their intellectual grades, are also retarded in all their physical measurements. They are not simply short or light weight children of their particular age, but all their measurements correspond to those of younger children, whilst the measurements of children who are ahead of their age, that is, are precocious, correspond to older children. This idea of physiological age suggests that the vital clock may go more quickly with some than with others. It might be worth enquiring whether these individuals run through life more quickly, or whether, as is more probable, their vital potentiality is better to start with.

RHYTHM OF GROWTH

In a vague kind of way the growth of children has been separated by some foreign writers into periods, an early plump period in the first four years, then a lean period of gawky growth in length from the fifth to the seventh year, with a second plump period of chubbiness from eight to ten, followed by another lean period from eleven to fifteen, and in the case of girls a third plump period up to eighteen or nineteen.

That the height is not exactly fixed is shown by the diurnal variation, mainly due to shortening of the vertebral column, as determined by Prof. T. A. Storey in New York. Seven young men measured for three years showed diurnal loss and nocturnal gain to an amount such that one might lose a centimetre and a half in a day within physiological range.

There is also a periodical seasonal change obliterated in English records. The variation seems almost the inverse of that for weight, and this was the cause of its being detected in London measurements (Fig. 4). Growth in height does not take place in a uniform way, as is usually stated, but with an annual rhythm which is better demonstrated in the variation in weight. This variation is sufficient to need consideration in determining standards. Averages derived from Spring measurements would differ significantly from those determined in the Autumn.

DISCRIMINATION OF STANDARD VALUES

So far as stature is concerned, race is the chief influence beyond control. Conditions within control are healthy infancy, freedom from early disease, sufficient food and wholesome environment socially. By selection of the children to be measured, excluding the deformed and diseased, the backward mentally, and the starved, ill clothed and city-dwarfed children, it should be possible to lay down standards for height considerably above the measurements at present considered satisfactory, and children whose growth had been arrested by deprivation could then be really assessed at a true estimate of their loss, instead of merely being compared with the average of another lot, nearly as badly starved, or chilled, deformed or misshapen from want of sufficient light, air or exercise.

A rate of change in height corresponding to physiological age and subject to correction for the time of year, and possibly month of birth, would give a figure by which any child ought to be capable of being judged as regards healthy growth at the times of observation, provided its curve of growth has been kept for some time.

For a general judgment of the whole life conditions of the children up to the time of observation, the standard of heights for boys should be above that given either by the British Association or Dr. Duke's tables for Public School boys, because in these tables it is certain that a number would be included who if not actually deformed by scoliosis or early rickets, would have had some arrest of growth from early childish or infantile diseases. In the lists too there would have been some of the retarded and backward cases, physically or mentally. Averages will not do. Heights of points on a map are measured from a datum line, and heights of individuals in a community must also be referred to a datum as standard.

These standards are ultimately to be obtained by processes of exclusion of non-standard children. If the ricketty children are excluded in the Aberdeen measurements, instead of boys of five and a quarter measuring 102.1 cm. they reach an average of 104.5 cm., an increase of about three per cent.

Similarly, if the condition of the (A) children of the poorest schools of Glasgow, who measured 138.5 cm., had been raised to that of the (D) best school they would have measured 144.5 cm., an increase of four per cent. Secondary scholars exceed the elementary in size by eight per cent. Again if the improved conditions of early life today are compared with the past generation, an increase up to four per cent is noted, and still more is expected, in stature. It is quite probable therefore that the standard height of English speaking boys is between five and ten per cent above that given by Dukes for Rugby pupils. With such a standardized material approximation to a permanent standard of heights should be obtained. Subdivisions of this material would be necessary into classes indicating racial strains, and adjustment by pigmentation and cranial measurements would afford corrections to greater exactness.

A proper standard will be somewhere above, but certainly not below the following provisional suggestion for standard heights of English speaking races.

Birthday	6.	7.	8.	9.	10.	11.
Boys	121.0	126.0	131.5	137.0	142.0	148.0
Girls	119.0	124.0	129.0	135.0	141.0	147.0
Birthday	**12.**	**13.**	**14.**	**15.**	**16.**	**17.**
Boys	155.0	161.0	166.0	170.0	172.5	174.0
Girls	156.0	162.0	166.0	167.0	168.0	168.0

The values of the representative series of boys' measurements are shown in figure 1, along with the suggested standards. The standard for girls has also been shown by a thin line of vertical dashes. For the sake of numerical comparison the actual heights can be stated for part of school age.

Heights on Birthday	10.	11.	12.	13.	14.
Poorest Glasgow boys	123.9	128.5	132.8	136.6	140.2
English Elementary (T. and G.)	127.2	132.0	137.2	141.2	144.4
English and American (S.)	131.5	135.8	139.8	145.0	151.4
Chicago Boys (Baldwin)	135.9	140.3	145.4	150.2	155.0
Supernormal (Baker)	137.1	141.7	149.0	155.0	157.2
Standard (Kerr)	142.0	148.0	155.0	161.0	166.0

The amount which the above groups fall short of possibilities—that is if all hindrances to healthy efficiency were removed—in other words, the measure of deprivation shown in stature, may be expressed in percentages below the standard as:—

Percentage Defect from Standard on Birthday	10.	11.	12.	13.	14.
Poorest Schools in Glasgow	12.8	13.2	14.3	15.2	15.5
Tuxford and Glegg's: English E. S.	10.3	10.9	11.4	12.4	13.0
Stephenson's: English and American	7.4	8.2	9.8	9.9	8.8
Baldwin: Chicago	4.3	5.2	6.2	6.7	6.6
Baker: Supernormals	3.4	4.2	3.8	3.7	5.3

If any real progress is to be made in utilizing measurements of children's heights as indicators of social defect or amelioration, present school methods and comparisons must be scrapped for scientific enquiry on the lines suggested above. All crude averages of unassorted material are untrustworthy, fallacious and tend to minimize rather than display those defects from deprivation which are the lot of the majority of the elementary school children.

WEIGHT

Whilst the prescription of a standard of heights seems quite attainable, there are many complications in respect to weights.

This is well shown by two neighbouring playground classes of girls, measured at intervals. The height increase was exactly equal, whilst the weight increases in one case were double the other.

Girls	Nos.	Average Ages	Class	Average Weight Height	Weeks in Class and Percentage Increases				
					1	8	16	27	32
Weights	20	12 7/12	A	34.06	100	99.16	100.17	102.50	103.70
	24	12 1/12	B	32.11	100	99.16	99.47	104.73	107.07
Heights	20	12 7/12	A	142	100	101.4	102.1	103.00	103.30
	24	12 1/12	B	138	100	101.4	102.1	103.03	103.35

This fragment of information showed that height and weight might vary independently. As a matter of fact the class B which put on weight most had milk and biscuits in the forenoon, and a short afternoon rest which the other class did not enjoy.

When open air schools were first started in England they were judged extravagantly on the alteration in height, weight, and hæmoglobin content of the blood, because contrast was made with rates of growth as deduced from annual increases.

SEASONAL VARIATIONS IN MEASUREMENTS

When suitable controls were examined the first impressions had to be altered. At Shooter's Hill [London] twelve children pres-

ent through three successive summers of the open air school grew in weight at the rate of .217 per cent for the whole period, but thirty normal boys in an ordinary East End school grew .326 per cent weekly in 26 weeks including Summer. At the Tuberculosis School the ten Summer weeks' growth was at the rate of .48 per cent against ten winter weeks rate of .20 per cent.

Definite seasonal variation in growth both in height and weight is established, although the exact seasons and amounts have not yet been determined.

So too hæmoglobin probably has a definite seasonal variation, which remains to be determined, and will probably be found equally well apart from the open air schools.

Indeed the open air school as such appears an over rated institution, and if the conditions of temperature, humidity, relative amounts of feeding, rest and exercise, together with changed academic tasks, and relaxation were adopted in school houses similar results might be expected.

These variations with season had been noted before.

Schmid-Monnard of Halle, as part of his short but brilliant career, took up the question of growth of holiday children, and determined that although there was a retardation in the first year of school life, seasonal variation began in the second year of infancy and was later independent of school, and that the increase of weight was at its maximum in September. Quite recently Professor Spühler of Berne has attempted to show that it is want of exercise which largely accounts for arrest of growth in Winter. He took two groups of students at Küssnacht, one exercised, the other unexercised and compared them as to increase of weight and certain measurements in Summer and Winter with the results shown in the table.

Küssnacht Seminarists Aged about 18	Weight Increase Kilos		Height Increase cm.		Chest Cfe. cm.		Thigh Cfe. cm.	
	Summer	Winter	S	W	S	W	S	W
No Physical Training	4.0	0.3	2.9	1.2	2.8	1.0	2.0	0.7
Regular Gymnasium Courses	3.9	1.5	2.6	1.0	3.1	3.2	1.8	0.8

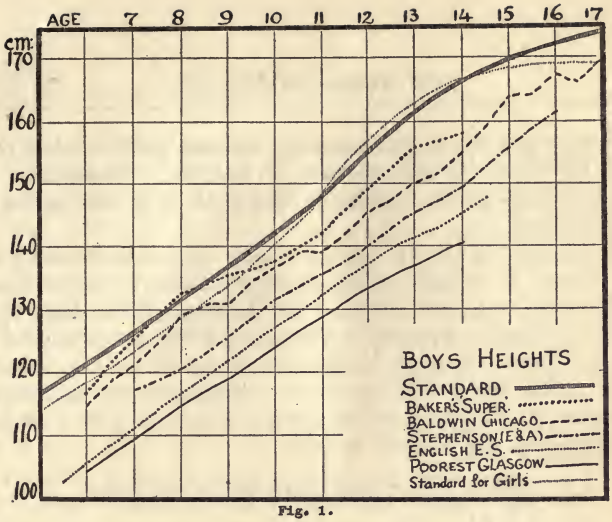

Fig. 1.

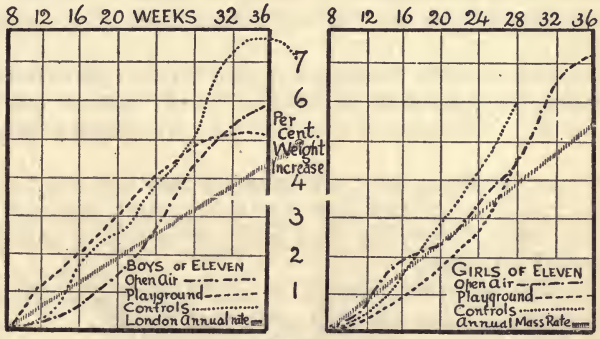

Fig. 2.

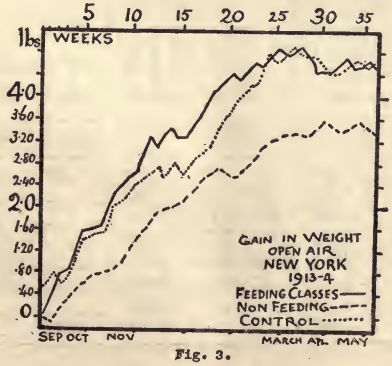

Fig. 3.

Dr. Henderson Smith has recently shown that there is a regular seasonal variation in the increase of weight in Sanatoria, which falls in the first three months of the year and attains its maximum in September.

Children easily gain or lose in weight. It is this which makes rate of change in weight valuable as an index of present health. There is noted ten years ago in the London Education Reports "Evident systemic depression resulting from the slightest operations. In most cases of treatment of teeth or operations for adenoids, there was a distinct effect, which in many showed itself as an arrest in the increase of weight, and in a few as loss of weight going on for a week or two."

LOSS OF HEAT AND DEFICIENCY OF FOOD

These rates of change in weight can be determined as averages for long periods from the usual tables of massed results. Taking out shorter periods however seasonal variation, otherwise masked, shows up.

Some children were regularly measured for periods up to 36 weeks from the beginning of April. The girls of eleven may be taken, but the variations in the other age groups were practically similar.

There were girls in open air schools, who had regular school meals; girls in playground classes without school feeding, control girls from the same schools; and lastly comparison rates derived from massed statistics.

The tabular statement shows the percentage growth for four weeks intervals for the different groups of girls.

Percentage Increases		Weights				Heights			
Girls aged 11½		Open Air Classes	Playground Classes	Control Classes	London Annual Rates	O. A.	P. G.	C.	Annual Rates
Actual measures		26.7	29.0	29.5	29.8	132.2	134.8	135.4	134.4
Weeks from April First	8	.00	.00	.00	.00	.00	.00	.00	.00
	12	.75	.49	.62	.80	-----	.29	.22	.26
	16	1.87	.91	1.42	1.60	-----	.59	.60	.52
	20	2.24	1.77	2.73	2.40	-----	.96	.90	.78
	24	3.36	2.81	4.22	3.20	-----	1.33	1.30	1.04
	28	4.60	4.62	6.00	3.80	1.70	1.56	1.70	1.30
	32	6.74	----	----	4.60	-----	-----	-----	1.56
	36	7.11	----	----	5.30	2.50	-----	-----	1.82

These groups were strictly comparable, and all increased at a greater rate than the annual rate would indicate, but the greatest increase was not in the open air children or playground classes but in the Controls. A similar set of boys give comparable results, but as no controls were specially taken the measurements of an ordinary school were utilized as controls.

The two parts of figure 2 illustrate this more rapid summer and autumnal growth in weight, and show how the loss of heat in the open air children retards their growth, if they have not ample feeding to compensate.

The same set of events is illustrated by a chart which was published for New York scholars of 1913. This chart also shows the rapid Autumn increase with slowing in the early part of the year and actual decrease about April and May. (Fig. 3.)

It would be interesting, if rather speculative, to consider what is the meaning of seasonal variation. With equal amounts of food and less call for heat production a gain in weight might be expected in Summer, but that does not account for growth in height at other times. The weight accumulation is chiefly about harvest and probably a long inherited habit, and natural preparation of a winter reserve store.

Relations of Height and Weight

Whatever the cause may be, the differing times and rates of growth in height and weight disturb their relations, and any index derived from them must be very variable unless a seasonal correction can be applied.

Two boys of the same age were followed for four years summering in open air schools. Fig. 4 shows their growth in weight during the summer sessions, and in height largely during the winter closure. The index of grammes per centimetre in height shown for the opening and closing dates of the school is very variable each year. The straight shaded lines show the annual rates for weight and height as deduced from mass statistics.

In dealing with massed statistics the weight varies with height almost independently of age, so that for practical purposes a limit can be set for each height below which weight should not fall. Taking about 2000 children in Miss Elderton's tables who were 45— inches high, and a similar number of 51— inches, and dividing them in young and old age groups, when these groups are calculated and drawn for a thousand children at each age group they nearly coincide. (Fig. 5.)

Similar results are got for the boys, and for other heights. It would thus be comparatively easy to determine a weight below which a child of a given height should be regarded as suspiciously unhealthy, but it is more difficult to determine the standard weight below which a child is to be deemed defective. Probably that must come mainly from considerations of height.

STANDARDS OF WEIGHT

Taking once more as illustrative types the 26 poorest "A" schools in Glasgow reported on by Leslie Mackenzie, the averages of English Elementary Schools compiled by Tuxford and Glegg, the English speaking children collected by Dr. Stephenson, and mainly secondary scholars, Baldwin's recent measurements of Chicago schools, and the wealthy scholars in the School of Education reported on by Miss Josephine Baker the weights found are given in the table.

Category	Sex	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
26 Poorest Glasgow	B	17.2	18.5	20.0	21.8	24.5	25.7	27.9	30.1	32.4	34.5	---
	G	16.8	18.1	19.5	21.0	23.0	24.8	27.0	29.7	33.0	34.8	---
English E. S. Tuxford	B	16.9	18.4	20.4	22.1	24.0	26.3	28.6	31.5	34.2	36.7	---
	G	16.4	17.8	19.6	21.3	23.3	25.6	28.2	31.6	35.0	38.0	---
English and American Stephenson	B	18.4	20.3	22.4	24.7	27.1	30.1	32.2	34.9	37.9	42.4	47.6
	G	18.0	19.4	21.3	23.6	25.3	28.2	31.0	35.1	39.8	44.2	47.8
Chicago Schools Baldwin	B	---	21.3	22.5	25.9	26.6	30.5	32.3	34.8	39.0	43.6	48.2
	G	---	19.6	21.8	23.2	26.4	29.7	30.2	34.2	43.0	46.5	50.8
"Supernormals" Baker	B	---	22.0	24.5	26.9	30.3	30.9	33.6	40.0	48.1	---	---
	G	---	---	21.1	24.6	30.1	30.7	34.7	38.3	38.5	46.1	51.4
Standard Weights Kerr	B	---	21.5	24.1	26.6	29.1	32.0	35.1	38.4	42.0	46.1	51.1
	G	---	20.5	22.9	25.4	27.4	30.0	33.8	38.7	44.1	48.0	51.2

The differences between boys and girls appear less marked in the poorer classes, and this shows up strongly in later school life.

Plotting out curves on a large scale from the table just given, and taking smooth curves which include them all, and marking the differences sufficiently between the sexes, values are obtained which must be a near approximation to the ultimate standards to be got in careful selection of children, developed without adverse physical environment. (Fig. 6.)

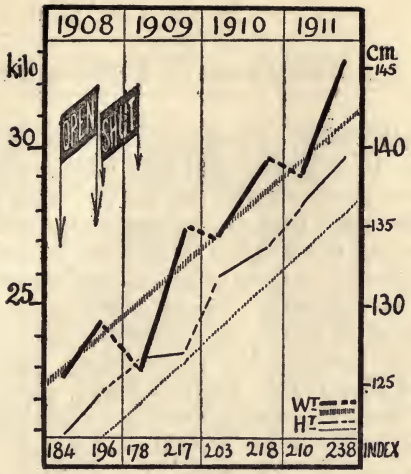

Fig. 4.

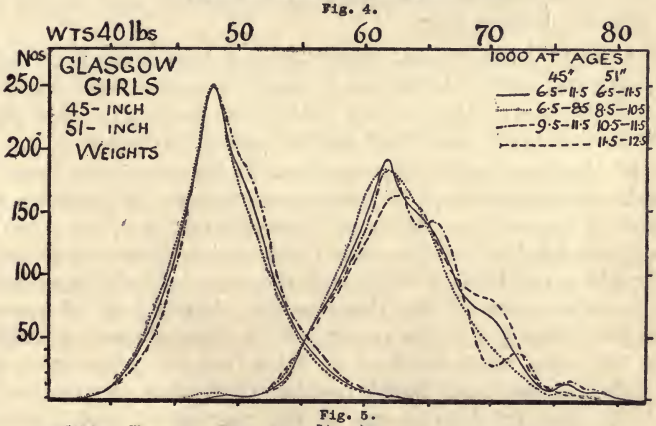

Fig. 5.

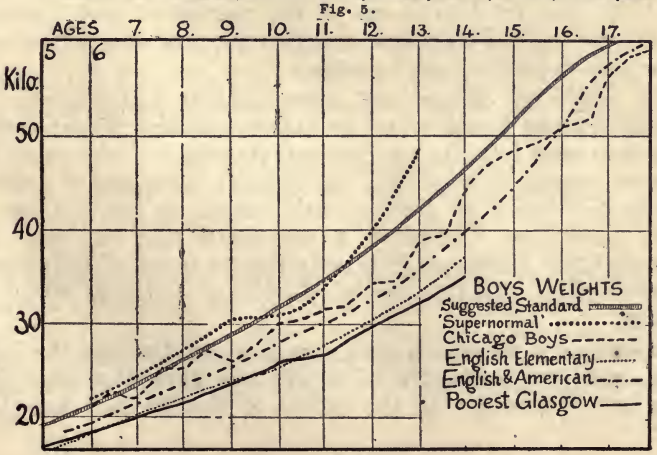

Fig. 6.

As concerns the value of these standards as of immediate utility, it is not to be expected that any ultimate standard will be materially above these weights nor on the other hand is it likely that any will be lower than the suggested heights.

For determining the weights it will not be sufficient to take a number of children of a certain height and weigh them, and take these weights as standard. The children must be critically selected. Disease of all kinds, and disability of every variety must be excluded, for instance the large flabby anæmic unexercised child, with cold blue hands, thickened lips, pulpy watery tissues and excoriated nostrils, so common among institution-reared children is probably often above weight, and should yet be excluded as of defective constitution, poor in immunity, and capacity to resist adverse environment.

The various indices that have been recommended by many writers are only satisfactory in a rough way for mass measurements. They can never replace individual judgment in a single case, and are simply empirical statements of averages.

One of the most assiduous workers in this field has been Dr. Tuxford. His measure of physical development in children only professes to be such an empirical formula but it is very neat so long as it is applied to the class from which it was derived. It should yield a product of 1000, and above or below this expresses defect or otherwise by the thousandth. Applied to 11-year-old girls in his tables 999 is the result. With other classes of children it fails, the same aged children in Miss Baker's tables give 1107 as the index whilst their North London Collegiate contemporaries yield 1143, and yet this is one of the neatest of such formulæ. They are no help. This paper suggests the usefulness of certain datum lines in public health matters.

As a nation we should not accept quietly the difference in physique between primary and secondary scholars. We must make all children pass into the one national standard of physique, and no longer regard as inevitable the inferior physique of artisans and superior build of professional classes, as set out by the British Association Committee a generation ago, but must recognize that the difference is largely due to want of adjustment of environment, and its amount a national index of social inefficiency.

On testing the standards here suggested by deriving the index of grammes per centimetre of height one finds that they give results in fair accord with the indices of English and American

children collected by Stephenson, but fall short in later school days of the ultra rich class of Baker, or the relatively too heavy girls of the North London Collegiate School.

THE GROWTH COEFFICIENT

Having settled on standards the next point for practical usefulness is to correct the annual rate of change down to monthly or even weekly coefficients, and here is reached ground "no man's land" as yet, where one must await future decisions.

The actual height or weight is not as valuable as the rates of change in either. The real index of nutrition then which is awaited is this corrected increment of growth for each month of the year, varying from high positive to actual negative with season, perhaps influenced by temperature, a little by race and social condition, but comparatively less still by actual magnitudes of height or weight, so that any normal ranges of variation in these have been neglected as of little moment for this important coefficient, the real indicator of present condition.

Once definite scientific enquiry is pursued, even with temporary standards as here suggested, the measure to work towards sets an ideal before the eye, and holds up a mode of estimating sanitary and environmental effects on the individual and defects in his condition, which will materially contribute to the national welfare of those who come after. It will indeed later afford in some things a vigorous measure of impending social reconstructions.

PHYSICAL PREPAREDNESS AND THE ADMINISTRATION OF SCHOOL MEDICAL INSPECTION IN THE UNITED STATES

By Lawrence Augustus Averill
Editor of The American Journal of School Hygiene

Perhaps one of the greatest lessons which the war has had for educators has been the emphasis which it has placed upon the necessity for greater physical preparedness. We have been calling for young men who were physically fit to endure the hardships and the privation of a soldier's life. Naturally we have felt

that we had a right to expect that most young men within the age limits would be found to be ready for immediate service, so far at least as their physical condition was concerned, for—so we assumed—if there is any time of life when the human organism should be at its maximum of health and vitality, certainly that time ought to be in the twenties and early thirties.

But what have we found? It is too soon yet to tabulate country-wide returns from the first draft; it will probably be many months before the statistics can be finally collated and classified. Basing an estimate upon the situation in many localities where careful records have been kept by the examining physicians and where the strict examination standards have been maintained, however, it is probable that less than 50% of the men called will be found to have passed the tests successfully. Writing in *Everybody's Magazine* (December, 1917) Dr. Edwin F. Bowers gives some interesting and significant information concerning these military "unfits." He says:

"...Of one thousand men examined by the editor of the Michigan State *Medical Journal,* one out of every six had teeth that disqualified him... One Brooklyn exemption board, early in the draft, examined six hundred men without being able to secure its quota of one hundred and ninety-one, and were forced to send out calls for an additional twelve hundred men. Another, during an entire day's grind of the grist, got only one man out of one hundred and four examined. Of course these are exceptional instances, but, as the physician chairman of one of the boards examining drafted men on the East Side of New York said: 'My six hundred and fifty rejections out of a total of fifteen hundred examined simply reflects the condition of poverty in my district It is safe to say that *forty percent of the young men on the East Side are unfit for military duty because of lack of proper nourishment and the lack of clinics to minister to their physical needs.*' "

Thoughtful men, however, did not need to wait for the results revealed by the selective draft in order to appreciate the true situation, for, much as the War Department needed men even before we formally entered the war, it was able to accept less than 21% of those who offered themselves for enlistment in the army, while of those seeking enlistment in the marine corps, only 9% could be accepted. The same relative ratio held true in the recruiting for the navy. In his 1916 Report, the Surgeon-General of the navy gave the results of recruiting during the year thus: of a total of 106,392 applicants 70% were rejected; and none of

the men examined were more than 30 years of age. Examinations made of applicants for admission to Annapolis between 1914 and 1916 showed that, of 3,416 boys tested, only 30% were deemed physically fit to be enrolled. During the month of March, 1917, of the hundreds of young men who sought to enter the naval service, but 32% were found physically fit. True, the type of young man who might be desirous of entering the military service in peace times could hardly be taken as being typical—physically or otherwise—of our young American manhood. The fittest type of youth would very obviously seek other means of earning a livelihood than within the army, navy or marine. Still, the fact that those who *were* desirous of entering the service made such a poor showing denoted a condition that was alarming and should have been more generally considered as such.

Almost exactly one year ago, on the eve of Congress' declaration of war on Germany, the Editor of this Journal, commenting upon the proposed introduction of military training into the schools of New York State, wrote:*

"During the school period a thorough and universal system of educational hygiene must be relied upon to keep our boys and girls physically fit—in the one case for the exactions of (possible) military training at 20, and in the other, like the girls of ancient Sparta, for the impress which they are to exert on future generations. It appears, therefore, that physical fitness to undergo military training is directly dependent upon, as it is also the logical consequent of, school health work. Indeed, without the latter to foster and direct the early growth and development of all school children, only the few who are naturally robust can ever be called upon for the former... We in America, always quick to follow the educational leadership of the Old World began, a few years ago, rather perfunctorily to imitate in this matter also, and school health work has become slowly an accredited aspect of our educational policy, notwithstanding the fact that *the public consciousness of our people has never yet been aroused to appreciate the need for real school health work.*

"...But thus far our work in this new field has been largely haphazard, unorganized and purely voluntary. We have not felt deeply the need of special provisions and special budgets. We have failed to mark the suggestive parallel between the physically unfit school child and the physically unfit soldier. We have

*Cf.: The Am. J. Sch. Hyg., Vol I, No. 4, pp. 68-73.

accepted silently the reports so often made to the effect that three-fourths of all our school children are physically defective and that approximately three-fourths of all applicants for admission into the army are similarly defective. It is only in a national crisis such as the present one that these facts are driven home to us in their true perspective. If the crisis develops to more alarming proportions we shall come to feel all the more keenly that, in the last analysis, the real potential bulwark of a nation is the child in the school room, and that it is largely his opportunities for correct, robust development that measure the ultimate defense of a people... Under present and near-future international relations, America needs and will need strong and well-trained men for her armies—and no man can say how many. Universal and systematic health work throughout the entire school life of the child will be necessarily the one great and unfailing agency in raising up a physically robust race, and thus in supplying this need."

Since these words were written, the crisis has developed to more alarming proportion, until today America finds herself within the battle line of democracy and of freedom. The need is now for men. Once already the selective draft has operated; it will soon operate a second time. It would be quite beside the aim of this article to enter into a discussion of the general physical condition of our young men in the twenties which this instrument has revealed. Nor would it be at all wise to infer that, since somewhere in the neighborhood of 50% of the registrants are found to be so ailing in some definite particular as to be either wholly unacceptable or to require expert treatment before they can be accepted by the army authorities for active service, that the destiny of the allied armies will one day ever be placed in peril simply because there cannot be found able-bodied Americans enough to cast in the straw that might result in victory to the allied arms. The question is not a question of enrolling enough men in the military organization to insure an allied victory; it goes without saying that our supply of available men is well-nigh inexhaustible. The question is rather one of raising the whole mass of our citizenry—at least in the next generation—on to a higher plane of physical soundness. The war has demonstrated graphically to us the fact that our boys are being permitted to come up through the schools possessed of all manner of physical defect, adding others as they proceed upward, until in the moment of emergency more than half of them are found to be too unsound physically to be of any value to their country from a strictly military point of view!

The case of Germany is often cited as offering an illustration of the opposite of this state of affairs. Scant honor be to Germany for anything in these days! We should not forget, however, that no inconsiderable factor which is enabling her to defy the righteous wrath of the world has been her generation-old policy of taking care of the physical welfare of her children. "If Germany does it, it must be wrong!" represents a fair popular estimate of things Teuton at the present time. Doubtless, too, her motive in this child-conservation work has been a wrong one, her dream having been to prepare her man power against the day when she should be pleased to summon it to Prussianize the world. It was merely another element in German preparedness. Lack of the same thing, on the other hand, is merely another element in our American unpreparedness.

Even the most disastrous wars, however, ordinarily serve to teach mankind lessons which otherwise he would not have learned for generations. So this Teuton-inaugurated shambles has brought with it innumerable lessons, and not the least of them is of the same nature as that which England learned at the time of the Boer war, namely, that one of the foundation stones of a wisely ordered nation in the hour of its need is the health of its citizens. So our plea for adequate physical preparedness for America is not founded upon any questionable motive of militarism and exploitation. It is rather the logical outgrowth of our wish to guarantee to every one of our people those inalienable rights which make not for liberty alone, but for more abundant life and the more secure pursuit of happiness. We believe that greater attention paid to school health work will simplify our problem in its incipiency and make more speedily for its early solution.

It is the firm conviction of the writer of this article that the introduction of a course in military training into our school system, as a means of making our children more physically fit, a proposal which is being advocated rather extensively just at present in this country, would be extremely unwise. The report of the committee on military education of the Department of Superintendence of the National Education Association, presented last year in Kansas City, was very sane and commendable in its discussion of this matter. According to the committee's findings, there are a great variety of reasons why such training is infeasible in either the elementary or the secondary schools. Boys under 17 or 18 years of age are too immature physically to perform satisfactorily the arduous work of training and too im-

mature intellectually to grasp fully the significance of the training and its responsibilities, or to take it seriously. In the second place, just at the time when military enthusiasts would force them into military training—somewhere between the ages of 12 and 18—the adolescent period is at its height, and the adjustments and life-changes that are normally transpiring may be most seriously disturbed by the exactions of military training. Third, the amount of time required of the pupil to make his training really worth while would be so great that it would interfere with his progress in his school course and with any vocational education which he might otherwise contemplate. Then, too, by subjecting secondary school pupils, or indeed any selected class of pupils, to military training, and relieving others of it, the duties of the national defense will devolve upon the better-educated class, while the poorer will quite escape.

Continuing, the report cites abundant corroboration of its position in the practice of the leading nations of the world. The great military nations, Germany, France, England, Russia and Japan, have not relied on the military training of boys. The military system of Switzerland, which is often commended as peculiarly appropriate to this country, requires military service of men over 20 but does not require military training of school boys. As further substantiation of its position, the committee cites the reports of the Special Commission on Military Education and Reserve of Massachusetts, of 1915, and the Commission on Military Training in High Schools of New Jersey, of 1917, both of which, after thorough investigation, rejected the military training of boys as inadvisable. Among other things, these commissions have demonstrated that military drill gives almost no stimulus or inspiration for actual service; that the weight of opinion of teachers, military experts, officers of the regular army and militia, as well as the general public is overwhelmingly against military drill; that neither obedience nor ideals of conduct as such are fostered by such training; that patriotism is not appreciably developed thereby; and finally that the amount of physical training which is afforded is no greater than might be realized in any good course in physical education. In this connection, Dr. Dudley A. Sargent, of Harvard University, Dr. W. E. Darby, of London, Ex-President Charles W. Eliot, and Capt. H. J. Koehler, instructor in physical training at the West Point Military Academy, are all quoted at some length as minimizing military drill as a specially valuable form of physical exercise.

The committee's chief conclusions are as follows:—

"...To be specific, we favor a course of military training which shall be universal and obligatory for all young men of nineteen years of age and over who are physically qualified, which shall be required of them at some time during the twentieth and twenty-first year, and which shall be maintained, directed and paid for by the federal government... As the military service toward which the training looks must be made efficient and must be rendered in behalf of the whole country, the training should be administered under national direction and at national expense.

"*We feel compelled, moreover, to say that if we must prepare and train men to be soldiers, our legislatures, national and state, must not evade the issue by shifting the burden to the shoulders of school boys, but should frankly and courageously place it where it belongs.*

"...Your committee must urge most strongly the preëminent importance of thorough physical training to all pupils of the schools and to the men and women of the country. Your proceedings and the expression of all thoughtful teachers have for years shown that the need of it has been recognized and urged by those who are directing the work of the schools and has not merely been made evident by present conditions. The present apparent imminence of the call for physically competent men has compelled an analysis of the results of agencies which provide them and has accentuated our educational deficiencies.

"It is true that physical health and strength are emphasized in all schools and that thorough physical training is given in some; but your committee recommends that a most comprehensive plan of bodily training, health protection and sanitary precaution be provided by all the states, through statutory enactments, for all pupils, and that all the instruction and exercises included in such a plan be made obligatory upon all pupils, boys and girls, of all ages who attend the schools."

Among the six final conclusions and recommendations of the committee, these three have to do with school health work:—

(1) A thorough and comprehensive plan of *physical training* should be provided and made compulsory upon all boys and girls of all ages attending the schools, and at the same time provision should be made for the extension of a similar kind of instruction to young people who are not in school through evening and continuation schools, recreation and community centers, and other agencies that may be established.

(2) Special attention should be directed to *personal hygiene.* This should include the care of the body, frequent and thorough *compulsory medical inspection,* and a consideration of the laws of health, strength and vigor.

(3) Provision should be made for *instruction in sanitation and safety precautions* for the purpose of guarding against disease and injury.

If I read aright the times, we stand today at the threshold of a new physical era. The task of the future is to be an enormous one. To rebuild ruined countries, to restore violated nations, to reinstate scattered household gods, will require men and women strong in body, great in heart and gigantic in soul. In order to make men strong in body we cannot wait until maturity, but must begin at just as early an age as we have been accustomed to begin to make them strong in intellect; that is, in the school. Only so shall we be able to bring to bear in season all the forces that make for rectitude and verticality in development. Already the American educational leadership is at work upon the problem. New York State, for example, has not only made medical inspection of her school children compulsory and placed it under the direction of a state medical officer, but she has written upon her statute books a drastic law providing for the physical training of boys. Similarly, Arkansas, Nevada and North Dakota are among those states that have recently enacted new laws relating to school medical inspection which, while not of a mandatory nature, at least serve well to show the trend of educational thinking along this line. So, too, there is scarcely a legislature in session this winter which has not before it a great multitude of bills making provisions for school medical inspection, physical training, departments of physical education, the establishing of free clinics, and a wide range of similar proposals all designed to better care for the health of school children.

Now the logical starting point in the inauguration of a state system of educational hygiene which will protect the health and promote the physical welfare of school children is the enactment of a mandatory medical inspection law such as is now operating in 5 of our states. Experience is demonstrating on every hand that unless such laws are compulsory they are of only comparative value. The facts at hand indicate that almost without exception the departments of education in states in which the medical inspection law is permissive *merely* are dissatisfied with the law, and are endeavoring to educate public opinion in their states to a point where it will demand that the law be made compulsory and

universal. If it is optional, results seem to show that most towns are quite content to follow the line of least resistance, and do nothing. Most of the larger cities already have some independent and more or less efficient system of inspection in operation in their schools.

With a view to determining accurately the present country-wide situation in this matter of school medical inspection, the writer sent out a circular letter, under date of December 26, 1917, to each of the 48 state departments of education in America, and to the District of Columbia. The information asked for in this letter fell under 4 heads: (1) whether state laws relating to medical inspection are permissive, mandatory or non-existent; (2) how the laws are administered by the state, *i. e.*, whether by the state board of education, or the state board of health, or by some other central body; (3) by what agency the law is administered locally in the towns, counties, etc.; and (4) whether or not the method is proving satisfactory and, if not, what changes are to be suggested. In the table below I have indicated the answers received to the first three of these queries; in most cases response was made directly by the state superintendent of public instruction; in some instances it came through a representative of the state board of health to whom it had been referred.

TABLE INDICATING THE PRESENT STATUS OF SCHOOL MEDICAL INSPECTION IN THE UNITED STATES, BY STATES

(Explanation: In the following tabulation, P stands for permissive law; M for mandatory law; N indicates the absence of laws relating to medical inspection; H stands for board of health; E for board of education; X indicates the absence of any state oversight or direction of school medical inspection.)

State	Permissive, mandatory or non-existing	Administered centrally by state board of health, state board of education, or other body	Administered locally by board of health, of education, or other officer
Alabama	N	H	H
Arizona	P	H	H
Arkansas	P	H	H+E
California	P	X	special physician
Colorado	P(1)	humane office (!)	teacher
Connecticut	M(2)	H	E
Delaware	N	X	--
Dist. Columbia	M	H	--
Florida	P(3)	inspectors of rural schools	-- H
Georgia	P	H	H
Idaho	N	--	--

Illinois	N	H	H
Indiana	P	H	H
Iowa	P	H	H
Kansas	P	H	H+E
Kentucky	P	H	E
Louisiana	P	H	H
Maine	P	H	E
Maryland	P	H	H
Massachusetts	M	E	E
Michigan	P	H	H
Minnesota	P	H	E
Mississippi	P	H	H
Missouri	N	X	--
Montana	N	X	--
Nebraska	N	H	H
Nevada	P	H	teacher
New Hampshire	P	H	H+teacher
New Jersey	M	E	E
New Mexico	P	X	H+E
New York	M	E(4)	E
North Carolina	M(5)	H+E	E
North Dakota	P	H	H
Ohio	P	H	H
Oklahoma	N	H	H
Oregon	P	H	H
Pennsylvania	P(6)	H	H (+E) [sometimes]
Rhode Island	P	E	E
South Carolina	N	H	H
South Dakota	N	X	H(7)
Tennessee	N	X	--
Texas	P	H	H
Utah	P	X	teachers(8)
Vermont	P	H	E
Virginia	N	X	--
Washington	P	X	--
West Virginia	P(9)	H	E
Wisconsin	N	X	E (usually)
Wyoming	N	X	teachers(10)

(1) except that examination of eyes, ears and nose is mandatory. (2) in towns of over 10,000 only. (3) but "mandatory as to sanitation." (4) except in cities of the first class, which are exempted by law. (5) but requiring only one examination in a period of 3 years. (6) but mandatory in cities above 30,000. (7) in case of epidemics only. (8) must examine sight, hearing, teeth and throat. (9) but mandatory in independent school districts. (10) in all towns of 1,000 population, or over.

An analysis of the returns tabulated above reveals the following interesting facts concerning the present somewhat chaotic

estate of school medical inspection in the United States. The District of Columbia is not included in the percentages given.

1. 14 of the 48 states thus far have no state laws either requiring or permitting the employment of medical inspectors.

2. 29 states have permissive laws, authorizing any towns to appoint school physicians if they elect to do so.

3. In only 5 of the 48 states are there mandatory laws which make obligatory on the part of every school unit the appointment of such physicians.

4. In 29 of the states still it is the state board of health which has the general direction of this work under its auspices. The state board of education is responsible for this oversight in only 4 of the states, while in one state (N. C.) these two boards administer the work jointly. Altogether 12 states have no central body which has assumed any responsibility for the health examination of their children.

5. Locally, too, it is the board of health that is most commonly charged with the direct responsibility for this work, this being the case in 19 states. Of the remaining 29, 12 require this duty of the school authorities, in 5 the two boards work jointly, while in 4 it is left entirely with the teacher, and in 8 no one has the responsibility, save perhaps in extraordinary circumstances.

But not only is there an absence of uniformity in the conception and administration of medical inspection in the several states; there is also little uniformity in the work done even within those states which, nominally at least, have mandatory laws. Massachusetts may be taken as the type in discussing this lack of state-wide uniformity in the local operation of laws relating to the medical inspection of schools, partly because she is so eminently a representative state in matters of educational procedure, and partly because a rather exhaustive study of the operation of the school medical inspection law in the state has just been completed and is available for citation (Published as Vol. 4, No. 11, November, 1917, Public Health Bulletin of the Massachusetts State Board of Health).

During the years 1915 and 1916 the State District Health officers conducted an inquiry into the present status of medical supervision in the public schools in the various cities and towns throughout Massachusetts, and, notwithstanding the fact that the school medical inspection law now has been in mandatory operation in the state since 1906, the grossest inequalities and disuniformities were discovered in the actual working out of the law. The study reveals the following facts:

(1) The number of physicians employed is determined apparently quite without reference to the number of pupils, since within the state a single physician may have under his care as few as 22 pupils or as many as 7,000!

(2) 172 of the 353 towns and cities in the Commonwealth pay their school physicians not more than $50. a year.

(3) The amount of time spent by the physicians in the performance of their duties, presents quite as great diversity. In 108 towns the time thus spent probably does not exceed 6 hours a year, while in 18 towns the time varies between 200 and 600 hours.

(4) In 210 towns the physicians work without any supervision; in 92 towns, they are supervised by the school authorities, and in 15 by the board of health.

(5) In 180 towns no records of their work are kept by school physicians, or else the records are scanty and not permanent, "the physician merely keeping a few rough notes, jottings for annual reports, enough to enable them to make out their bills, etc." Only 85 towns report their records even fairly complete.

(6) In only 92 towns do teachers receive any instruction from the physicians as to suspicious or suggestive symptoms of communicable disease or remediable defect. In 112 they receive absolutely no instruction from any source.

The Bulletin concludes with this very clear statement of the case:—

"The information given in this summary demonstrates beyond question the almost entire absence of uniformity in school hygiene work and the lack of any standard of such work as it is carried out in Massachusetts. The value of this work, however, when conscientiously and thoroughly carried out, is well recognized and established.

"At the present time there is nowhere lodged the authority, either in the State Board of Education or in the State Department of Health, to establish standards, even minimum standards, for the carrying on of school hygiene work. The matter is left wholly to the individual boards of health or school committees. Hence, though some communities are doing excellent work, many others are doing the work in a more or less perfunctory manner, failing to achieve the maximum benefits of school hygiene work.

"Under such circumstances it becomes an almost hopeless task to secure even a minimum standard of work in school hygiene, or to attempt to secure an approach toward more uniform practice and efficiency."

In concluding this paper, I should like by way of summary to offer a few criticisms and suggestions which are obvious.

1. The need for earnest and effectual school health work was never so plainly apparent as at the present time. One of the great lessons of the war to those interested in the cause of educational progress has been its demonstration of the failure of our social system to safeguard the physical health and stamina of our man-power and our woman-power. What in war times we have come to call preparedness has a physical quite as much as a military or economic or industrial aspect. True preparedness in human resources consists in a general condition of maximum readiness all along the line from the door of the public school to the training camp or the factory or the profession. And the relative dependability of this preparedness is progressively greater according as its foundations are wisely and substantially laid. Already many of the states have felt the urgency of better organized efforts to lay these foundations of good health in their children and are taking steps accordingly.

2. It appears to have been the history of the movement for school health work that it has had its beginnings in a state with provisions for medical inspection of school children, and from that has branched out in many other directions. Thus, it seems that the first thing for us in America to do is to begin the organization of our school health work with the enactment of state mandatory medical inspection laws. That done, we shall see our way to supplement it with the inauguration of various other of the principles of general educational hygiene.

3. But so long as our school medical inspection work is as haphazard and chaotic as is now unfortunately rather generally the case, we cannot expect to make much progress along these lines. Without any centralized method of supervising this work, and with no established standards or criteria for administering it —even within a state—its value must continue to be very much impaired. Constructively, and in the interests of more efficient organization of school medical supervision this Journal can only recommend, as it has so persistently recommended before, (1) that every state should create within the board of education either a division of educational hygiene or at least the office of state director of educational hygiene; and (2) that every state should speedily write upon its statute books a mandatory law which would compel every town or district unit to employ a competent school physician to have a general oversight of all the children in the public schools.

As to the first of these recommendations, there seems no really good reason why the state board of health should continue—as is the case in so many states—to direct this work. Safeguarding the health of the school child lies quite as much within the province of the educational system as does any other branch of educational work. It is in the interest of unity and efficiency to have all school matters under the jurisdiction of the school officials. The state division of educational hygiene, therefore, is properly affiliated with the state department of education. Only through the creation of such a state division shall we ever be enabled to systematize and universalize this work. It is needless to add that the local physicians, too, should be similarly employed by and affiliated with the school department.

4. Immediately adequate state provision for universal compulsory school medical inspection is made and some centralized body is empowered to administer the law we shall begin to make rapid strides in our general policy of school hygiene. The field of effort of an efficient state department of hygiene would be gradually widened to include state-wide surveys of the sanitary conditions of school buildings; of the health of school children; the general direction and oversight of city and rural departments of hygiene; the collecting of statistics and comparative data; the arranging of courses in hygiene for the grades and suggestions to teachers for conducting them; the working out and putting into operation of a state-wide program of physical education; together with such other administrative details and functions as might be in conformity with the task of directing the general work of educational hygiene throughout the several towns and districts of the state.

The first step toward an ultimate solution of the problems of educational hygiene lies in carefully organizing the work in every state on a practical and effectual basis.

SPEECH DEFECTS IN THE SCHOOL CHILD

BY CAROLINE A. OSBORNE, M. D.

Speech defects in the school child have an especial interest for the teacher. Most of the proof of acquisition of instruction imparted to the child must be judged by the oral response given.

When this response is delayed, or is rendered in a halting, inarticulate manner, the teacher is at a loss to decide whether the child knows the lesson or not. In fact, the ability to speak distinctly and effectively ought to be possessed by the child before entering school, or acquired readily after being in school a short time. It is neither fair to the teacher nor the class to spend class time trying to ascertain whether the defective speaking child really knows the lesson or not.

In general, speech defects will group into two main divisions, the *phonetic* and the *stuttering* types. While these may run into each other the lines will be seen to be very clear between the two. A further difference appears, in that the stuttering child is usually of normal mentality, and often of a superior degree of intelligence, and the nervous instability present marks a more facile cerebral functioning.

On the other hand, phonetic defects of marked and extensive nature are marks of defective brain development, and the defect may be of all degrees, from remediable conditions to hopeless imbecility.

As the child comes to the teacher, the defects most often met may be grouped into four divisions:

a. Infantile speech.
b. Defects of oral mechanism.
c. Slovenly, or careless speech.

(In the last grouping, also might be included inattentiveness or a low degree of attention to auditory stimuli. When this is present, the child should be examined for defects of hearing.)

d. Marked phonetic defect.

Infantile speech characteristics are so well known that no description is needed. The cihld of kindergarten or first grade age often shows an infantile quality in talking. This speedily disappears in the normal child, as he almost unconsciously adapts to the conventional standard of his companions. When a child of ten or fourteen shows "baby" talk, a mental examination will practically always reveal mental retardation, often of a higher degree than has been suspected from the general appearance.

Defects of the oral mechanism are rare, and speech in such children is conditioned on the defect present. Slight defects may be overcome by persistence on the part of teacher and child. Higher degrees of defect require first, surgical intervention, and then later training to talk. The presence of enlarged tonsils and adenoid growths need not necessarily cause defective speech, but may depress the general condition in such manner that carelessness in speech may follow.

Slovenly speech may come from many factors. The local causes are not important, but the hearing may be at fault, or the brain behind be defective. The general health and the vitality of the child may be below the needs for effective speech. It takes strength to talk, and intelligent speech is conditioned upon a certain degree of brain development, and coincident physical vitality.

The more *marked phonetic defects* in a child that cannot be brought up to normal speech, are defects that are more often due to defective mentality. We find the tongue big and clumsy; sometimes it is so large that the mouth cannot hold it. The ability to close the lips, to form the labials and labio-dental sounds, needs well developed oral and tongue muscles. In fact, *all* speech sounds need accurate muscular coördination for production. In defective brain functioning neither the muscles nor the nerves are able to achieve easy, automatic workings. In these cases, the defective speech is merely the outward indication of inward defect.

Stammering and Stuttering. These may be discussed together, for there is no real difference between them. Symptoms group all the way from hesitation in speaking, so slight it may well be only the slowness of a thoughtful person, to prolonged efforts at articulation, and all degrees of spasmodic efforts in the futile attempts to get out speech which will not come. The most obvious symptoms of trouble is spasm of various parts of the vocal mechanism when the effort of voluntary speech is made. This spasm is more or less constant, increases on attention to the patient, as a rule, and is absent when the individual is alone, or is speaking in concert, or is singing.

Etiological factors. Many seemingly contradictory factors are involved, which will, however, easily group under the general time classes of hereditary, congenital and acquired characteristics.

Hereditary elements of instability in the parent will tend to reveal themselves in the offspring. For this reason, when there has been present in the parent or ancestry neuro-muscular instability manifesting itself as alcoholism, gout, syphilis, insanity, epilepsy, hysteria, or even the minor neuroses and psychoses indicated by the terms, "odd," "cranky," "quarrelsome," "inability to make a living," etc., the resultant weakening of the parent stem is very likely to be manifested in a weakened, less resistant condition in the child.

Congenital factors likewise rest primarily on the physical substrata of parental health. In addition, there are many diseases

which may be acquired during pregnancy by the mother, which will react on the growing child, making for retardation.

Acquired defects at once give us fertile sources of investigation. In the first place, the neuropathic elements in the parents react both on the child and the environment.

Careless handling of the child in the early hours of life may give and fix a habit of fear which is the cause of incipient nervousness and the forerunner of all kinds of neuro-muscular instability. The educational influence of the home and care really mold the baby into certain habits of reaction almost at once. A quick and jerky manner of handling, of talking, a roughness or lack of adaptation to the infant needs, will wear out a slight neural adaptability long before it has a chance to conserve strength for its immediate, let alone its future needs.

When, a little later, the function of speech is acquired, and the self-consciousness is developing, the instability incident to any developing function is increased by fright, excitement, worry, anxiety, etc., until the little patient is unable to express himself at all in public, even though the public be that of his own sheltered home.

To an observing, imitative child, the speech of another child who stutters may be provocative of trouble. Yet a healthy skepticism as to this being causative as much as it is supposed to be, is aroused by the fact that it is the rule and not the exception to find only one of a family who stutters. If imitation were as baneful as it is said to be, the whole community would long ago have lapsed into hopeless stuttering.

The real findings are much more interesting and suggestive. Usually, beside the stuttering child, we find no one else in the family who stutters. The history is often given of stuttering of a distant relative, seen rarely or never by the child. But we do find other speech defects, as lisping, indistinct speech from many causes, late development of speech, and the like. These are the things one would postulate were he working out from a theoretical angle lines of deterioration of neuro-muscular structure. Phonetic defects of speech are due to inaccuracy of muscle action, clumsy, slow, and awkward movements, rather than the spasmodic incoördination present in stuttering.

When, a little later, the child goes into the community, either in play or in school, he finds imperative need for instant vocal adustment. It may well be here that the beginning of the confusion incident to stuttering may be sought. There are complex visual, auditory, and other stimuli from numerous sources pour-

ing in upon the child, and the sense of "away-from-home-ness," big in a delicate child, all these factors combine in a confusing mass in the little sensorium, and there results incipient movements in all directions, lacking inhibitions from the bewildered cortex.

These confused, half inhibited motions, and the simultaneous high tension which pervades the whole organism under the strange conditions, are all factors which unite in forcing an uncoördinated mass of heterogenous stimuli upon the immature speech mechanism, and the only possible thing that can happen is the attempt of many muscles to work at once, and the resulting stuttering is initiated under the most favorable conditions for habit formations that psychology can offer.

The same events, under favorable circumstances, are the experience of every child. The husky youngster will hold his own and refuse to be confused, or if he is temporarily abashed, he usually works it out in general motor activity, and a night's sleep finds him master of the situation.

Such, in general, are the factors which result in the habit of stuttering. Each time the child stutters, the method of wrong functioning is being ingrained into neural structure, until it becomes a habitual response, and the child is at a disadvantage in the social, the school, and the business community.

Glancing briefly at some authorities on conditions present in stuttering: Scripture assures us that the cause of stuttering is "a diseased state of mind, which rises from excessive timidity and shows itself in speech peculiarities tending toward a condition of segregation which will enable the person to avoid occasions where he will suffer on account of timidity."

But even Scripture recognizes the fact that the majority of timid people do not stutter.

Fletcher, in an experimental study of stuttering some years ago, discusses, besides the motor phenomena, which he studied graphically, the following factors:

"The essential condition of the rise of stuttering seems to be a complex state of mind, which should be classed generically as feeling, in the wider sense of the term. It is to be noted that the quality, rather than the intensity of these feeling states governs the rise of the defect... In general, those feelings which tend toward inhibition or depression are the ones most likely to be the precursors of stuttering. Probably both act as cause and effect. The states of feeling causative vary in degree from strong emotion to mere attitudes or moods. In addition to the

states of feeling, stuttering seems to be affected by the quality of the mental imagery, by attention and association. All movements, that, like those of speech, are incapable of clear and detailed imaginal representation in consciousness are, in the same way as in speech, liable to the functional disorders that are analogous to stuttering. When the stutterer's attention can be distracted from his speech, his stuttering usually disappears. The affective and emotional experiences... determine the rise of stuttering."

Blumel, in a two-volume monograph, makes *auditory amnesia* the proximate causes of stuttering, but hedges a bit when he adds the collateral causes of mental confusion and fear as complicating the disorder. It is evident there is a common cause behind all three of these authorities, and Scripture's grouping of the disorder among the psycho-neuroses, is much more to the point.

Swift ascribes the cause of stuttering to defective visual psychic development. In his study of his cases, he has found many that do not visualize during speech processes. It is very possible that the stuttering child has never been able to develop its visual or auditory areas to the same degree of perfection that the non-stuttering child has, but this has yet to be proven. It is true, however, that unless and until the mental content, which the speaker wishes to convey to the hearer, be very clear and in the focus of consciousness during the act of talking, the hearer will not be much enlightened by the effort to convey information. In any event, until different sensory areas are developed properly and patiently, up to the level of easy functioning, speech may show persistent disturbances, which disturbances disappear entirely after the lagging cortical areas are brought up to full functioning. Further, this intensive sensory training brings up adjacent areas to better functioning, as they come under the influence of improved nutritive conditions.

While this paper is not intended as a discussion of methods of treatment in stuttering, one comment as to the end results of patients trained in sensory development, is in order. Any one who listens to the conversation of the cerebral trained person, and then to the one trained to speak by the aid of some trick of breathing, or some muscular movement, will at once be struck with the difference. The patient who has been trained to let sensory content and associated areas dominate motor speech, will not only speak in a manner convincing to his audience, but his audience will see and hear what he, the speaker, does, for the speaker's attention is on "mental-content-to-be-imparted" and

not on "mental-trick-to-help" him as with a crutch, over vocal pitfalls. The normal speaker, just in proportion to his development of ideas to be communicated, keeps in focus the mental content, while swiftly arranging and rearranging that content to the situation present.

Treatment of Stuttering: The treatment of stuttering logically falls into two main lines of procedure; first:

1. *Treat all underlying medical, i. e., diseased conditions.* Stuttering is first distinctly a medical problem, and can only be gotten at by the specialist trained to interpret the action and interaction of pathological conditions involved in spasmodic conditions present.

2. Train the patient into correct breathing habits. This is the training of physiological function, and should go on from the two angles:

1. *a.* Breathing exercises and
   b. Muscle training of respiratory muscles.
2. Vocal exercises, skilfully planned to bring up the breathing.
3. Train the vocal muscles into vocal function. The stages here will perhaps develop better from the elemental to the complex. The patient can be drilled through sounds, syllables, words and sentences, simple to complex.

Next, the repetition of ideas, simple and compound, first from the teacher, next, spontaneously given by the pupil.

The keynote of success is repetition, over and over again. The speech mechanism in these patients is not mature enough to function automatically until it has had much more practice than the child who does not stutter. This functional training is the only means by which structural stability may be attained. Through all the above, insist first on slow, easy execution, and eliminate haste. Speed of utterance can be worked up at any time, but not until perfect function is present.

Second: All the above will group into one line of treatment, which perhaps would be considered the method of direct attack. The next steps group under the more specialized, and apparently indirect, method of brain training, building up faulty sensory and motor areas, developing inhibition, self control, and a wider range of mental activity. The patient must be trained gradually to get used to and then respond to many stimuli, for, until this is done, he is unequal to the social exigencies of even home life, much less is he ready for the wider range of demands of community needs. The patient must also be trained in the mode of

response. As we watch these patients we realize their inability to receive, much less respond, to many stimuli at the same time. Until drill, over and over has developed their ability in these lines, we cannot consider our patients cured.

Treatment of Phonetic Defects: All of these cases should be gone over to determine the cause of defective speech. Cases due to defective mentality should be placed in special classes. Borderline cases ought not be left with normal classes unless the defect speedily clears up under instruction. Lisping and slovenly speech may only need sharp drill. Inaccurate answers, implying inaccurate perceptions in the child should lead to the refering to the ear specialist for possible auditory defect.

Mild cases of deformity, as with the slighter degrees of cleft palate, can be dealt with successfully by phonetic drill adapted to the child. In fact, most of the children in the ordinary school room need, as undoubtedly grade teachers realize to their sorrow, constant drill in accurate articulation, and voice placing.

While it perhaps is not within the scope of this paper, yet a word may be said as to attention to the ordinary speaking voice, aside from any question of defect. While one may or may not accept the psychologist's grouping of all experiences as pleasant or unpleasant, with shadings through excitement, depression, strain and relaxation, etc., yet every one recognizes the value of a pleasant voice and the deplorable results that may be attendant on the unpleasant voice. Forcefulness, virility, vigor, "get-up-and-get" qualities, may be as clearly expressed in a pleasant voice, while all the sympathetic and helpful qualities gain much if rendered in a voice of pleasing quality. The use of one or the other may mean success or failure to the user. The acquirement of such a voice should be the aim of every teacher and pupil.

GLARE AND THE STUDENT'S LIFE*

By James Kerr, M.A., M.D.

Whilst thousands of children are being provided with glasses, who would probably for all practical purposes be better without them, no great attention is paid to the school conditions which

*Reprinted from SCHOOL HYGIENE (English), February, 1916.

are at the root of eye discomfort. Merely to provide concave glasses for the school myope is but locking the stable door. Penny-in-the-slot hygiene wants figures and immediate results, and cannot wait, so that remoter, although more important, conditions not thought of in its philosophy must be otherwise provided for. Glare, possibly the most important of all ocular conditions, is certainly so in relation to the student life. For the mass of students it is more important than abnormal refraction or the provision of spectacles.

Attempting to define glare only renders the difficulty of the task and our ignorance more evident. Since a discussion at the Illuminating Engineering Society some years ago further work and, more especially in America, the writings of P. W. Cobb and the experiments of M. Luckeish have considerably developed the subject. Much yet remains as regards theoretical explanation of detail, but considerable practical advance has been attained.

THE EYE AND THE GLARE

Glare is essentially subjective, depending on the eye. The retina is its sole test. The function of the retina is mainly to record changes of colour and brightness on its nerve endings. Where any unvarying condition exists there is no visual record. The area in the field of vision corresponding to the blind spot is not noticeable, nor are shadows of blood-vessels which always fall on the same place in the eye. It is only by altering the direction of the light to cast the shadows in an unusual place that they are noticed.

The ocular mechanisms have evolved reactions to obtain clear images on the retina. Refractive conditions, pure and simple, which can indeed be eliminated by wearing glasses, may be left out of account, as the effects are discounted by their continuity and permanence, and the images subconsciously accepted as the best.

Most important, but slow, is *adaptation* of the retina, which retracts the pigmentary cells in low illumination, increasing exposure of the sensitive structures to the light, making the "dark adapted" eye many hundred times more sensitive than when "light adapted." The eye integrates the average illumination and slowly adapts itself, so that in the extreme case of coming from a dark room to daylight glare is temporarily felt from slowness in adaptation.

The quantity of light passing through the pupils is regulated almost instantaneously by the iris causing contraction of the pupil in bright light; this is a temporary reaction, as with the development of adaptation in the retina the pupil again dilates. In the case of near objects being looked at the pupil also contracts, cutting off the peripheral rays which, by spherical aberration, would have interfered with the clearness of definition of the retinal image.

The accommodation of the lens for the different distances of objects looked at is almost instantaneously effected to get a defined image.

The eye has no mechanism making it achromatic, so that in white light there are several overlapping images—for instance, if the red rays are clearly focussed, the image formed by the yellow is somewhat out of focus, and that formed with blue still more so. Probably adjustments are being made all the time for these various foci in the way the microscopist uses his fine adjustment to visually penetrate a section. If an advertisement, as seen on the Underground, is noticed, where bright green and red letters occur on a black ground, the subconscious efforts to adjust causes mistaken judgment of distance, and the red letters, thought to be nearer, appear to stand out in front of the general level. These mechanisms are in constant play. Very accurate detail is not physically wanted, and probably not considered in most visual affairs. The silhouetted image is filled in mentally from previous experience, although subconsciously a clear image is sought by the ocular mechanisms.

Clear contrasts in the image require rapid removal of metabolic products formed by light from the visually sensitive material; if this is not done, after-images result, persisting and interfering with visual contrasts.

Unfocussed light falling on the retina as a haze may mar the contrasts, or, if its brightness approaches that of the focussed image, obliterate it.

The two last conditions also occur intrinsically. Malnutrition or interference with the retinal circulation causes after-images from the sluggish removal of waste products in the retina. One of the earliest signs of migraine, often preceding the headache, is glare from persistence of after-images. So, too, in toxic, fatigued, or exhausted conditions, *muscæ volitantes,* the shadows of little cells and obscurities in the vitreous, usually unnoticed, set up after-images which are noticeable and sometimes obtrusive in consciousness. In neurasthenia persistence is also frequent. The ap-

although only functional, yet of some duration. In rare cases there may occur permanent organic changes. The commonest instances are met with in amateur observers, whose eyes have not been properly protected when watching sunspots or eclipses, and in whom a permanent blur in the visual field remains (scotoma). Less effective degrees have functional effects lasting for hours or even days. A person walking westward on a sunny afternoon on closing the eyes can often see numerous, round, equal-sized black spots, generally in a row, the after-images of the sun on the retina, although he may not have specially looked at it. These are examples of glare from actual intrinsic brilliancy of the images falling on the retina, even when at its best adaptation for them. In connection with modern lighting problems, where the sources of light are hundreds of times more brilliant than those of the last generation, this cause of glare is important. It is now agreed that no source of light in school or house should be visible which presents a higher intrinsic brilliancy than about three foot candles a square inch. Electric filament lamps whose brilliancy by the square inch may be reckoned by the hundred or even thousand, and the incandescent gas mantle, should never be exposed to the eye, but constantly shaded. Prismatic glass shades and ribbed glass do not always get rid of glare, although they help to diffuse illumination, and for ideal results even they should have opalescent coverings. By this means a large uniformly brilliant surface is possible, and of a degree which does not cause any glare even when directly viewed.

ADAPTATION OF THE EYE TO LIGHTS

The head lamps of cars or acetylene flares not only act by producing a transient blinding after-image through excess of light, as by the fact that, in their case, the image is usually suddenly thrown on the dark adapted eye, and therefore produces a relatively enormous effect. The gas flame or electric bulb, which may be intensely glaring at night, shines almost unobserved by the eye adapted for daylight.

The object looked at should be the brightest in illumination; if a brighter object is in the field the eye tends to turn towards it, so that here at once is a cause of discomfort.

The eye appears adapted to the general average lighting, but more especially for the brightness of the image on the macula; that is, the object looked at. To an audience sitting on a sunny day in a large room with shaded windows at one end behind the

platform, on a small part of a window being uncovered the glare was unendurable, but as the whole window was opened up, and then the neighbouring couple of windows, although the general lighting became possibly hundreds of times as strong as before, it was more uniform—eyes became adapted, and the room seemed lighted without any glare.

Temporary glare may thus occur in an eye adapted for low illumination, and this will be likely to happen in a poorly lighted room which has streaks or reflections of bright light in it. Badly set prism glass, or plate glass with designs cut in it, if set low in a window, are likely to set up nearly horizontal streaks of light with such a glaring effect.

Sunshine is educationally very objectionable in a class-room. Mere superstition credits it with strange powers over germs which it cannot reach or touch. A western sun low on the horizon shining into a class-room by glare can reduce the average visual acuity. The old-fashioned ribbed glass, formerly popular in ground floor rooms, had similar effects.

It is adaptation which explains the great differences between intensity of artificial and natural lighting required. With fairly uniform distribution of light adaptation does not cause glaring trouble, but with masses of brightness and darkness glare may be felt. A black board set against a white wall may be troublesome. Again, an actual instance occurred in a class-room with good light from 2- to 6-foot candles on the desks on an average day, but the play shed was complained of as too dark for use with lighting of six to twelve candles, the only difference being in the adaptation of the eyes to the brighter light of the playground.

UNFOCUSSED LIGHT AS A SOURCE OF GLARE

Unfocussed light as a cause of glare interfering with the focussed image chiefly arises from shiny surfaces reflecting images of sources of light into the eye; the eye is accommodated for the object looked at, and this unfocussed light is from an image far behind the reflecting surface, and even if these unfocussed images are not to be considered as images, they are the cause of side lights entering the eye nearly in the line of vision, and thus setting up haze. The glaring effect which they produce depends on the amount of this light entering the eye compared with the amount from the object forming the image.

In daylight a brightly-lighted window in a dark room may be glaring, and pasting tissue paper over the window, partly by dif-

fusing the light and partly by permitting more dark adaptation of the eye in the room, may actually make the room appear brighter. For the same reason indirect illumination, owing to the higher light adaptation of the eye, is less efficient visually with equal amounts of light than other well-planned system of direct or half-direct lighting.

In rooms, especially if not well lighted, the moderately adapted eye may resent shiny surfaces of walls or desk tops, and if there are few bright sources of light high in the room the reflections from shiny objects may exert a kind of distracting effect, especially if attention is beginning to flag.

SHINY SURFACES AS CAUSE OF GLARE

All school-room surfaces, furniture, or walls are therefore recommended to avoid bright varnish or smooth gloss, and to have dull non-reflective finish.

The essential feature, however, of glare in school is that too often the total light tends to minimal rather than excessive amounts, and that, as in the case of the railway clock, the straining after clear images by ocular fixation intensifies any glare effects. This is more marked in certain cases; for instance, the presbyope whose glasses are not strong enough and whose accommodative capacity is sinking, constantly complains of glare with artificial light. More important, however, and probably part of a vicious circle, is the effect in the young student who is habitually using the eyes in an intensive way, far beyond what any of the generations before have done. The spasm of overworked ciliary muscles and their nerve centres, and possibly allied conditions of structural irritation with nutritive changes in early myopia, have made the eye sensitive of glare in any effort at exact work, although he no longer meets the jumping gas flame which caused his parents to seek relief with a colza lamp. The eye strain due to glare becomes increasingly obtrusive after the twelfth year. It is reading, writing, and figuring that demand accurate images, although even here the scholar works without the proof corrector's eye for detail. In these tasks especially is glare evident; it becomes insistent and is distracting to attention, seriously hindering the efficiency of educational aims.

Whilst daylight troubles from the glare of shiny desks or walls are not likely to be remarkable in the absence of sunshine or bright sky, artificial lights may be very troublesome, and as the shiny reflection glares proportionately to the intrinsic brilliancy

of the source of light it is an additional reason for urging as an absolute rule that NO NAKED FILAMENT, MANTLE OF FLAME SHOULD BE PERMITTED, NOR ANY SOURCE OF LIGHT WITH GREATER INTRINSIC BRILLIANCY THAN THREE FOOT CANDLES PER SQUARE INCH.

The next noticeable source of glare in teaching is the black board. A black and matt dull surface is worth maintaining by weekly attention. A good position of board avoids reflection of lamps, windows, or bright walls in the faces of the pupils; by suitable tilting these images can be thrown in other directions harmlessly. With artificial lighting the yellow light requires good contrast to be maintained between the colour of the chalks and the board. The written figure should be brightly lighted from above so that any regular reflections fall towards the floor. A high accessory lamp near the board and shaded completely from the pupils aids illumination and lessens the relative degree of glare. Excessive contrast, as from a white wall behind, has already been mentioned as a cause of discomfort.

Glare from paper is the commonest source of trouble to the student, even with moderate lighting. Although understanding of glaring paper helps many school problems it has had little attention beyond the condemnation of glossy surfaces, until well worked out by Luckeish.

The rays of light from any object which fall on a mirror are regularly reflected, that is, they pass off in such a way that a perpendicular to the surface of the mirror where each ray is reflected is in the same plane and makes the same angle with incident and reflected ray. The light falling on other flat surfaces is partly reflected in this way (regular or specular reflection) so that it appears to emerge from a point behind the surface corresponding to the position of the source or object in front. Another part of the light, however, is reflected irregularly and goes off in all directions, so that it appears to come from the surface itself and not from any image behind; it partly penetrates the surface, and is the light by which the surface is characterised and recognised. This irregular reflection or scattering of light takes place in all directions, but as a rule there is excess nearly in the same plane as the incident light.

For school purposes of reading and writing all the contrast possible between the black of the letters and the white of the paper is required. The surface brightness of the paper should be about a hundred times that of the ink. Only the irregularly reflected light which shows up the colour of the ink and texture of the paper is wanted by the eye. The eye is accommodated to the

focus of this paper and ink. The amount of regular reflection, if any, from the surface tends to form an image of the source of light which appears to be behind the surface, and for which the eye is not accommodated, so that diffusion circles of unfocussed light are formed on the retina, blurring and interfering with the image of paper and print, and causing glare. The proportion of this regular reflection must be kept as low as possible. By pressure of the types it is possible for the black printed letters to have a smoother surface than the white, so that beyond a certain angle of incidence of the light illuminating the surface the letters are as bright or brighter than the paper and become invisible.

The ratio between the reflected (glaring) and scattered light gets more the greater the angle of incidence, so that obliquely-placed paper may be very troublesome. The conditions of glare in low degrees are accentuated by ocular sensitiveness due to malnutrition of the nervous elements of the retina, as in early myopia, spasm, migraine, neurasthenia, and chronic fatigue from excessive eye work. Beyond this the position of the eye must fall within the region of regular reflection, for which reason commonly in olden times reading was done standing at a desk, looking down on the book placed at such an angle that any regular reflection remains about a constant brightness, although the glare-light, book, and eye are not approximately in the same plane glare does not predominate, as, for instance, with the light coming over the shoulder. It is, however, not only actual lights *en face* (as when a student sits at home at a centre table with a light in the middle of the room), but also bright reflected images which also act as equal to sources of light.

As the surface brightness of the print and the paper varies inversely as the distance of the source of light, whilst the glaring reflection remains about a constant brightness, although the glaring image decreases in size or area, the brightness of the print increases and the relative contrast with the glare gets less as it is brought nearer the source of light. Where no regular image tends to be formed, as with indirect lighting, for instance, glare is absent. Indirect lighting, however, has many disadvantages for school work, and semi-direct, with large sources of light of a brilliancy of the same order as the neighbouring ceiling, appears the best for school, and has little tendency to formation of after-image.

Having reduced the factors of glare in size and direction of light source, the paper surface itself and the ink are worth much care. Paper can be obtained matt and dull enough to avoid glare, and yet smooth enough for any print or illustrations.

TESTS AND STANDARDS FOR GLARE

An accurate method of fixing definite measurements of glare easily is required. Ingersoll has devised an instrument which polarises the regularly reflected component, and measures its amount by the displacement of a Nicol prism. Mr. Trotter has also devised an instrument for this purpose.

As the brightness of the surface varies inversely as the distance from the source of light, whilst glare remains unaltered, this ought to be utilised for a simple means of standardising paper.

The external factors of glare, excess of light, and misdirected light are within control in the class-room, the hygiene of which is now being overlooked and neglected in this country. The ocular factors of nutritional conditions, fatigue, and overwork are being neglected for provision of glasses, but these factors are of extreme importance for students.

The proof of the benefit of attention to ocular hygiene has been afforded in recent years by the steady and continuous fall in myopic conditions in the higher classes of Swedish schools through increased lighting, reformed time-tables, and the abolition of the German type.

PUBLICATIONS RECEIVED

A MANUAL OF PERSONAL HYGIENE, by George D. Bussey, Head of the Department of Science, East Boston High School. Boston, Ginn and Company, 1917. 156 pp.

A brief manual in hygiene, suitable for the upper grades. The author makes no attempt to enter into a discussion of the anatomy of the organism, being content to append a 5-page outline of some of the important anatomical and physiological facts about the human body. Each chapter is prepared strictly from the point of view of correcting existing defects in the organism or of preventing such defects from ever coming to pass. In this disregard of structure he is quite right. The dry bones of the old orthodox *physiology* are no longer to be resurrected in the elementary school. Some of the topics treated include breathing and ventilation, food and digestion, sleep, exercise, mental attitudes, nose and throat affections, tobacco and drugs, bacteria and poisons, and a chapter on emergencies. While there is nothing new or unusual either in subject matter or method of treatment, the text is for that very reason quite unobtrusive and represents an enumeration of a great number of health principles in a handy form for the use of intermediate classes. Pupils should be stimulated to consult the complete texts by the very suggestive questions which are found at the end of each of the twenty-one short chapters.

SPEECH DEFECTS IN SCHOOL CHILDREN, by Walter Babcock Swift, A.B., S.B., M.D. Director of the Kinder-

garten Speech Clinic, etc., etc., Boston, Massachusetts. Boston, Houghton Mifflin Company, 1918. 125 pp. $0.75 net. In the *Riverside Educational Monographs.*

A rather long and varied experience in dealing with speech disorders, with apparently much success in method, is responsible for this latest contribution to the matter of speech defects in children. In an extended introductory statement, Dr. Swift calls attention to the fact that the speech defects of childhood are hard to eradicate and are extremely likely to become permanent if not taken in time. Defective speech marks the inefficient worker, puts up the bars to social success and usually impedes education. The body of the essay becomes an exposé of the "modern" treatment of stuttering, and, needless to say, this "modern" method is Dr. Swift's own. Briefly, the author's method consists in establishing calm and clear images in the patient's mind, for "several normal individuals were tested with a list of some fifteen hundred questions to ascertain the content of their mind during utterances. This conscious content was found to be a visual image. (Apparently there were no traces of other types of imagery.) Then a similar series of stutterers was put through the same experiment and it was found that they constantly lacked this visual image *while they were stuttering.*" Dr. Swift assumes this lack of visual imagery to be a cause of the speech irregularity, not the effect, as would be more natural. "Upon this research finding is based our treatment, which, in a word, consists in very gradually developing first meager and then larger and then very extensive visualization processes over the speech of the stutterer and so giving him that apparently essential faculty which is found constantly present over the speech of normal individuals. . . . We begin with a series of breathing exercises. These are intended to instill control of the breath and to develop concentration. After this, the patient is asked to hold the voice on a single musical note or tone during the prolonged expulsion of the breath. Then, in addition to holding this note, he is asked to pronounce a word . . . . After that. . . . we begin with single words and proceed gradually to the use of short sentences, long sentences, verse and prose, short original stories, and long pieces of dramatic literature until we have developed elaborate visualization processes to the more or less complete elimination of the stuttering habit. Uninterrupted suggestion accompanies these steps."

Thus while in our opinion Dr. Swift's psychology is quite wrong, and his "method" represents really nothing new in this field, his patients improve markedly not so much as a result of a clarified visual imagery but rather as a result of the constant drill in correct pronunciation, breath control and proper nervous balance. Apart from this rather dubious psychology, and a somewhat obtrusive emphasis placed always upon his "accept-no-other" "method," Dr. Swift has succeeded in stating in non-technical language a great many defective speech truisms that will be distinctly valuable to the average teacher.

THE TEACHING OF HYGIENE IN THE GRADES, by J. Mace Andress, Ph. D. Head of the Department of Psychology, Boston City Normal School, Boston, Massachusetts. Boston, Houghton Mifflin Company, 1918. 177 pp. $0.75 net. In the *Riverside Educational Monographs.*

The purpose of this book is to give teachers and school administrators some practical suggestions on the teaching of hygiene in the grades. The word "hygiene" is here given a broader interpretation than giving instruction to children in a formal lesson a few minutes every day or week; it refers to those influences brought to bear on the children by the teacher, both incidental and systematic, to conserve and improve their health.

An effort has been made to emphasize the following points: (1) the value of health to the individual and society; (2) the relative importance of hygiene in the curriculum; (3) the present unsatisfactory status of the teaching of hygiene; (4) the specific goals of the teaching of hygiene; (5) effective methods of teaching; (6) the application of these methods to the most significant problems of teaching; (7) the special health problems of both city and rural schools and their solution; and (8) definite references to the best literature for teachers and pupils.

The great goal in hygiene teaching is habit formation, and most educators have not seriously considered the fundamental importance of the teaching of hygiene. Dr. Andress is quite frank in maintaining—we believe, rightly—that the pedagogy of hygiene in our schools is largely a failure, and its status may still be summed up identically as it was a number of years ago by Dr. Crampton, who declared it to be "a sinister fact that most of the teaching of hygiene in our schools is a farce;" or by Dr. Richard Cabot, who in a similar view referred to hygiene as "the yellow dog among the studies of the curriculum." The attempt of Babbitt (Survey Committee of the Cleveland Foundation) to discover just what hygiene teaching amounted to in Cleveland illustrates well this general aversion of most teachers toward the subject. "A member of the survey staff," says Babbitt, "went one day to four different classrooms at the hour scheduled on the program. In two cases the time was given up to grammar, in one to arithmetic, and in one to music (!) Cleveland would not be found alone in this evasion of hygiene.

The Teaching of Hygiene in the Grades attempts to account for this almost utter neglect of a very vital subject in the curriculum. Dr. Andress has put his ideas in very readable language, and the book should prove of very great value and suggestion to the teacher. Copious references to the sources, as well as to easily available illustrative literature are a feature of the volume. True hygiene teaching becomes after all largely a training in the psychology of habit formation, and it is from this point of view preeminently that this monograph is prepared.

THE DISTRIBUTION AND RELATIONS OF EDUCATIONAL ABILITIES. By Cyril Burt, M.A., Psychologist to the London County Council. London, Darling and Son, 1917. 93 pp.

This scholarly volume contains three preliminary memoranda on the distribution and relations of educational abilities. The first study is concerned with the distribution of this ability among children in the special (M. D.) schools; the second with that among children in the ordinary elementary schools; and the third is on the relations between ability in different subjects of the school curriculum. In its conception as well as in the minuteness of results stated, this volume stands quite unique in the annals of educational research. In effect the work represents the results of an exhaustive survey of the entire elementary school popula-

garten Speech Clinic, etc., etc., Boston, Massachusetts. Boston, Houghton Mifflin Company, 1918. 125 pp. $0.75 net. In the *Riverside Educational Monographs.*

A rather long and varied experience in dealing with speech disorders, with apparently much success in method, is responsible for this latest contribution to the matter of speech defects in children. In an extended introductory statement, Dr. Swift calls attention to the fact that the speech defects of childhood are hard to eradicate and are extremely likely to become permanent if not taken in time. Defective speech marks the inefficient worker, puts up the bars to social success and usually impedes education. The body of the essay becomes an exposé of the "modern" treatment of stuttering, and, needless to say, this "modern" method is Dr. Swift's own. Briefly, the author's method consists in establishing calm and clear images in the patient's mind, for "several normal individuals were tested with a list of some fifteen hundred questions to ascertain the content of their mind during utterances. This conscious content was found to be a visual image. (Apparently there were no traces of other types of imagery.) Then a similar series of stutterers was put through the same experiment and it was found that they constantly lacked this visual image *while they were stuttering.*" Dr. Swift assumes this lack of visual imagery to be a cause of the speech irregularity, not the effect, as would be more natural. "Upon this research finding is based our treatment, which, in a word, consists in very gradually developing first meager and then larger and then very extensive visualization processes over the speech of the stutterer and so giving him that apparently essential faculty which is found constantly present over the speech of normal individuals. . . . We begin with a series of breathing exercises. These are intended to instill control of the breath and to develop concentration. After this, the patient is asked to hold the voice on a single musical note or tone during the prolonged expulsion of the breath. Then, in addition to holding this note, he is asked to pronounce a word . . . . After that. . . . we begin with single words and proceed gradually to the use of short sentences, long sentences, verse and prose, short original stories, and long pieces of dramatic literature until we have developed elaborate visualization processes to the more or less complete elimination of the stuttering habit. Uninterrupted suggestion accompanies these steps."

Thus while in our opinion Dr. Swift's psychology is quite wrong, and his "method" represents really nothing new in this field, his patients improve markedly not so much as a result of a clarified visual imagery but rather as a result of the constant drill in correct pronunciation, breath control and proper nervous balance. Apart from this rather dubious psychology, and a somewhat obtrusive emphasis placed always upon his "accept-no-other" "method," Dr. Swift has succeeded in stating in non-technical language a great many defective speech truisms that will be distinctly valuable to the average teacher.

THE TEACHING OF HYGIENE IN THE GRADES, by J. Mace Andress, Ph. D. Head of the Department of Psychology, Boston City Normal School, Boston, Massachusetts. Boston, Houghton Mifflin Company, 1918. 177 pp. $0.75 net. In the *Riverside Educational Monographs.*

The purpose of this book is to give teachers and school administrators some practical suggestions on the teaching of hygiene in the grades. The word "hygiene" is here given a broader interpretation than giving instruction to children in a formal lesson a few minutes every day or week; it refers to those influences brought to bear on the children by the teacher, both incidental and systematic, to conserve and improve their health.

An effort has been made to emphasize the following points: (1) the value of health to the individual and society; (2) the relative importance of hygiene in the curriculum; (3) the present unsatisfactory status of the teaching of hygiene; (4) the specific goals of the teaching of hygiene; (5) effective methods of teaching; (6) the application of these methods to the most significant problems of teaching; (7) the special health problems of both city and rural schools and their solution; and (8) definite references to the best literature for teachers and pupils.

The great goal in hygiene teaching is habit formation, and most educators have not seriously considered the fundamental importance of the teaching of hygiene. Dr. Andress is quite frank in maintaining—we believe, rightly—that the pedagogy of hygiene in our schools is largely a failure, and its status may still be summed up identically as it was a number of years ago by Dr. Crampton, who declared it to be "a sinister fact that most of the teaching of hygiene in our schools is a farce;" or by Dr. Richard Cabot, who in a similar view referred to hygiene as "the yellow dog among the studies of the curriculum." The attempt of Babbitt (Survey Committee of the Cleveland Foundation) to discover just what hygiene teaching amounted to in Cleveland illustrates well this general aversion of most teachers toward the subject. "A member of the survey staff," says Babbitt, "went one day to four different classrooms at the hour scheduled on the program. In two cases the time was given up to grammar, in one to arithmetic, and in one to music (!) Cleveland would not be found alone in this evasion of hygiene.

The Teaching of Hygiene in the Grades attempts to account for this almost utter neglect of a very vital subject in the curriculum. Dr. Andress has put his ideas in very readable language, and the book should prove of very great value and suggestion to the teacher. Copious references to the sources, as well as to easily available illustrative literature are a feature of the volume. True hygiene teaching becomes after all largely a training in the psychology of habit formation, and it is from this point of view preeminently that this monograph is prepared.

THE DISTRIBUTION AND RELATIONS OF EDUCATIONAL ABILITIES. By Cyril Burt, M.A., Psychologist to the London County Council. London, Darling and Son, 1917. 93 pp.

This scholarly volume contains three preliminary memoranda on the distribution and relations of educational abilities. The first study is concerned with the distribution of this ability among children in the special (M. D.) schools; the second with that among children in the ordinary elementary schools; and the third is on the relations between ability in different subjects of the school curriculum. In its conception as well as in the minuteness of results stated, this volume stands quite unique in the annals of educational research. In effect the work represents the results of an exhaustive survey of the entire elementary school popula-

tion of a single representative borough in the north of London, with a three-fold purpose in view: (1) to discover both the actual and the most suitable lines of demarcation between children in the ordinary schools and children admitted to special schools for the mentally defective; (2) to obtain some estimate of the number of backward children in the ordinary schools; and finally, (3) to verify the hypothesis of a "general educational ability" underlying work in all school subjects, and to estimate the reliability of current methods of marking and classifying children according to the degree in which they exhibit that ability. The investigation followed two main lines of approach. First, an extensive survey was made for general educational ability, which embraced all the children upon the roll of ordinary and special (M. D.) schools. Secondly, an intensive examination was made of particular children and particular schools, including all the special (M. D.) schools by the method of mental and scholastic tests. The results were treated statistically.

Among the conclusions reached by Mr. Burt are: (1) the educational attainments of a so-called mentally defective child correspond on an average to those of an ordinary child of just over half his age. (2) Children in special schools are characterized more by backwardness in school work than by defective intelligence. (3) Measured by the method of standard deviation, normal children "tend to vary in educational ability above and below the average level for their age as follows:—at the age of 10, by at least one year; at the age of 5, by half a year, and at the age of 15, in all probability, by one and one-half years; and so on, by about one-tenth of their age." (4) Among individuals of an ordinary school class, ability in any one subject tends on the whole to be accompanied, to a greater or less degree, by ability in nearly every other subject. (5) School achievements are due to mental qualities of two kinds: first, a general ability entering into all school work; secondly, special aptitudes for particular subjects.

This rather remarkable volume contains 32 tables and 15 elaborate diagrams which summarize graphically the quantitative results of Mr. Burt's study. An excellent introduction by Mr. R. Blair, London County Education Officer, is included. "When the present crisis is over," writes Mr. Burt, "the nation will stand confronted with the task of social reconstruction. In preparation for this general overhauling one urgent item is the research for which I have appealed. To take the place of the ability that has been lost to the community we have to discover the best methods of detecting fresh supplies of ability and the best means of training and utilizing it to the utmost of which it is capable. Scientific research in education is thus needed not only to enhance the practice and profession of teaching, but also to promote the welfare of the nation in the near future."

THE CAUSES, PREVENTION AND TREATMENT OF VISUAL DEFECTS IN SCHOOL-CHILDREN. By Dr James Kerr. London, Adlard, 1913. Reprinted from *School Hygiene* for November, 1913. 7 pp.

THE CHANGE IN IDEALS FOR VENTILATION. By James Kerr. London, Adlard, 1915. Reprinted from *School Hygiene* for August, 1915. 8 pp.

GLARE AND THE STUDENT'S LIFE. By James Kerr. London, Adlard, 1916. Reprinted from *School Hygiene* for February, 1916. 10 pp.

The American Journal of School Hygiene

VOL. II JUNE, 1918 No. 2

PUBLISHED QUARTERLY, IN MARCH, JUNE, SEPTEMBER AND DECEMBER

Edited by Lawrence Augustus Averill

with the assistance of the following contributing editors:
Professor William H. Burnham, Clark University
Professor Fletcher B. Dresslar, George Peabody College for Teachers
Professor Lewis M. Terman, Leland Stanford Junior University
Dean Louis W. Rapeer, University of Porto Rico
Dr. C. Ward Crampton, Department of Education, New York City

SUMMER SCHOOL SANITATION

By L. W. RAPEER, University of Porto Rico.

I. THE SUMMER SCHOOL A NEW PROBLEM

The marvellous rise and geometrical increase of the automobile business in America in the last few years, adding a totally new mode of travel and transportation to human life unguessed before, has a very interesting parallel in the unheralded increases of summer schools and summer-school attendance in this country. A curve plotted to show the growth of the first would be no more rapid and striking than would a similar curve for the latter. Since William Rainey Harper's daring initiative and originality created the summer school at the University of Chicago and led it on to great success, making it a regular part of the year's university work by the four-quarter system of three months each, this new form of service and opportunity has been rapidly taken up in manifold forms all over the country. It is as natural now for many thousands of persons to go to summer school as it is for countless thousands to ride in automobiles. Attendance of six thousand students at Columbia is announced, for example, for a summer term of six weeks. In 1916 a total of 300,000 summer school students were reported to the U. S. Bureau of Education and by 1920 the number will probably be not less than a half million. The number of schools, instructors, and students reported to the U. S. Bureau of Education have about doubled in the five-year period ending 1916. Initiative, originality, and willingness to experiment in President Harper and Henry Ford have made these benefits possible.

But Harper lived long enough only to initiate the summer school. It is for those who follow and have the administration of summer schools in charge to perfect them, even as the automobile has been perfected. Hundreds of summer schools open their doors each summer to tens of thousands of students (especially to teachers who have been housed up in more or less ill-ventilated and insanitary school buildings during the year) and give them a great variety of subjects of study, at great expense both to the public and to the student. Only one who has been in the closest touch with such students year after year and who himself has been through the struggle to utilize summers for educational advancement can fully realize the great sacrifices made by such students for the summer courses. Only those who are administering these schools and have each year to provide a big faculty of instructors and other necessities can realize the social expenditures. The young instructor with his leisurely methods and impracticality and the older instructor who has somehow lost his grip on the minimal essentials and fundamental necessities for the students who have traveled far and are sacrificing much to get help in meeting life's daily problems in concrete situations, cannot always realize the terrible resentment of their students or of the administrator of the summer session, at dilatory methods and waste of time which often interfere seriously with making the six to twelve weeks count for the very most for individual and national welfare. Nothing less than downright efficiency is the unshirkable responsibility of the summer school.

II. THE PROBLEM OF HEALTH AND EFFICIENCY

Health is the first wealth, and if possible the summer school should contribute largely to both physical and mental well being and happiness. It certainly should not lessen these fundamental blessings. But the summer schools so far have been interested in other than health matters, such as subjects of study, courses, credits, registration, and problems of scholarship. The same buildings (created years before on now obsolete theories of sanitation) are used for the summer as for the winter sessions when howls the wintry blast and forced ventilation systems are in operation. Students, especially men, frequently wear nearly the same kind of heavy clothing as during other months of the year. They eat much the same kind of food, largely heat producing, and attempt to study in much the same condition as during the regular school year.

Now all this must be changed. Special adaptations for these half million persons and thirty-five thousand instructors in about fifteen-hundred summer schools must be made to very unusual school conditions, such as: (a) summer heat, sometimes so oppressive for days or weeks as almost to make any effort, physical or mental, hateful; (b) a short term in which must be accomplished a great deal at high pressure; (c) special need of recreation and physical and mental rejuvenation and refreshment because of the accumulated fatigue of a year of school or other work; and (d) new theories and facts of hygiene to which adjustment must be made.

The old ventilation theory, still taught in most schools and the one on which the buildings we must use in summer at present were constructed, namely, that the causes of the ill effects of bad ventilation are a depletion of the oxygen supply and the increase of carbon dioxide and other matters, has been exploded. The romance of the investigations in this field is very fascinating. It is not the chemical composition of the air which features but the mechanical condition of the air; not so much air in our lungs and in our cells, but air properly moistened, heated or cooled, and perceptibly in motion, and affecting not the lungs but the heat-regulating mechanism of the skin.* We cannot here stop to prove these principles. The greatest of the conclusions, so far as practical management goes, is that of the necessity of moving air in contact with the skin. Everyone knows what an electric fan does in hot weather. We cannot do much yet, perhaps, in controlling either the humidity or the temperature of the air in ordinary summer schools; but we can work revolutionary changes with correspondingly gratifying results in providing air in motion in our summer-school buildings.

I am typewriting these thoughts out on a high, broad veranda of a tropical bungalow in Porto Rico. I am thinking of some fifty summer schools at universities, normal schools, and elsewhere in the States where I have taught, lectured, or visited during the past twenty summers, and I am thinking, also, of our land of perpetual summer here. It is the twenty-second of January and the night is that of midsummer in the States, the temperature at seven-thirty being seventy-four, Farenheit, and the humidity

*Recent studies by investigators from the University of Chicago show the influence of race in this matter. Americans were found to have 558 sweat glands and negritos 709 per square centimeter. This means about 27 per cent more evaporation of perspiration and consequent cooling for the negrito. Hindus have even more, 738, American negroes 597, Filipinos 653, and Moors 684. The Hindu has nearly a third better heat regulating mechanism than his English conqueror.

very great, ninety-five (percent of saturation). Here is the land of the trade wind with steady breeze much of the year from one constant direction. This is the great ventilator of our perpetual summer schools here; but unfortunately the school buildings of the Island have been planned and constructed by men from the States who have used much the same plans here as are used in the northern tier of States with their below-zero winters and with their lighting and ventilation from but one side of the room, and with, consequently, no flow of air when fans are not running. Our unilateral lighting dogma has everywhere meant unilateral ventilation—which means practically no ventilation by natural agencies, the free winds of heaven. Children and teachers sit in stuffy and suffocating rooms in physical and mental torpor while God's fresh breezes are blowing for man's benefit just outside the windows.

III. THE SUMMER-SCHOOL BUILDING

What must be done in Porto Rico and all such tropical or semi-tropical places, and in the States for our summer schools, must be the erection of classrooms at right angles to the prevailing winds with windows on *both* sides of the rooms for the free current of air. No glass is used in windows here, only shutters, with movable horizontal slats. This is a Porto Rican custom and is good. The left side of a standard classroom, about thirty-two by twenty-four feet in size, should be almost entirely open to light and air from the rear of the room to within about six feet from the front, and from the ceiling down to the level of the pupils' eyes. On the opposite side, to the right of the pupils, who should have most of their light coming from the left, must also be wind openings. These may be windows above the blackboard opposite the windows on the left of the pupils. These short windows may also (contrary to the theories of most school hygienists) admit light to advantage. Ventilators may well be placed, also, in the front and rear walls to permit the free passage of air, and fitted with shutters with which to regulate the amount of wind and sunlight. Direct sunlight must be kept out while classes are in session, and the frequent rains, sometimes in torrents, must be excluded. If a properly-designed porch, or balcony, is placed on both sides of such a classroom, desirable shade is provided, sufficient light can be admitted, rains may be kept out, and students will have a place to stand or to sit and study, sheltered both from sun and rain.

If a building of a number of rooms is desired, one, two, or more long rows of such standard, at right angles to the prevailing winds (of summer in the States, of the trades in Porto Rico), may be constructed. Concrete and tile roofs help in promoting coolness, but this is another story. Place two such rows of classrooms twelve to fourteen feet apart parallel to each other and place two other rows on top of these; connect the two tiers of classrooms with a roof, add two-story porches, or balconies, to either side and perhaps to the ends, and you have before you the fundamentals of an ideal school building for summer schools in the States or in the tropics. "Up North" such a building can easily be constructed in such a manner as to be as satisfactory for winter use as for summer; but the big principle of the future is that school buildings must practically all be constructed for *both* summer and winter purposes. We can take out glass windows and put in shutters in the summers if we wish; we can make almost any kind of adaptation desired. Numerous possibilities and hypotheses for construction crowd the mind for attention. We exclude them to make other suggestions.

There is no reason why special buildings should not be erected for summer use only, summer open-air schools of the coolest possible construction. These can be used where the old buildings are entirely unsuited for use in hot weather (and this undoubtedly includes a majority of those now in use). Many things may be done, of course, to make these old-time buildings better adapted to winter conditions but they are hardly adapted for any use but storage purposes for summer. For brevity, I suggest a few possibilities by points:

1. Porches or balconies may be erected to shut out the sun, provide shade, and exclude rains.
2. Awnings over windows may be used.
3. Shutters of wooden slats, or thin boards, far enough apart to permit air but not blinding sunlight to enter will in most cases prove useful. Shutters on hinges seem to solve the problem of handling sunlight, rain, wind, etc., in the best manner.
4. Extra windows may be cut into any outside walls, and usually at small expense.
5. Extra windows may be cut in the right-hand wall, as students sit, especially if such wall open into a hall or other space wide enough to prevent noise from entering from adjacent classrooms. These may be over the blackboards or full length where blackboard space is unimportant.

6. Extra windows, preferably above the blackboards, or ventilators which permit the entrance of air but not much light except on the ceiling, may be opened in the rear wall.

7. Ventilators, or rather wide boards slanting upward toward the ceiling from the outside, may be used in windows cut in front. ("Window" really means here a place for wind to enter, not necessarily light).

8. Large, broad-bladed electric fans may be suspended from the ceiling for summer use. Drug stores, movies, and other progressive institutions use them; why not summer schools where more people are collected for longer periods and at more worth-while occupations?

9. Oscillating fans may also be used and placed on walls or on a front desk. I have tried one large fan on my desk in several summer schools, such as those of the University of Illinois and Pennsylvania State College, with good results. Such fans, however, are probably unnecessary much of the time where there are proper window openings.

10. To provide more breathing pores for the room, extra doors with panels of shutters may be used. When opening on an outside or inside corridor, such doors provide for free entrance of air and the corridor roofs keep out rain and direct rays of the sun. Shutter doors are very common in the tropics. Most outside shutters on windows and doors also have extra wooden doors to lock over the shutters during violent rains or when the house is to be left unoccupied for a while. These are small single boards of the size of the shutter and on hinges. It seems that the shutter comes about as near the solution of plenty of air under regulation with plenty of light and avoidance of rain as anything yet devised. Certainly glass windows should not be found in buildings used for summer schools since they keep out a free movement of air. No ordinary shades are tolerable in such open windows. Shutters, only, seem to solve the problem.

11. Some leading hotels have tried the experiment of running cold water through radiators in order to keep down temperature. Cold water may be obtained from several sources and may be made cold by an ammonia plant such as is used for making artificial ice. This system might not prove practical even in a large building with many classes, but this has not been proved.

IV. RECIRCULATION FOR SUMMER SCHOOLS

A totally different hypothesis is that of recirculation, a principle also advocated for winter schools—that of closing the building tightly and by means of a fan or fans moving it around through the building, cleaning and humidifying it in the basement after it goes through the fan by passing it through a rain of very fine droplets of water. Where tried, this plan has worked very well and has saved approximately half of the coal bills of winter. The higher price of coal and the need of saving due to the war and multiplied cost of living will force extensive experimentation and adoption of this scheme before long. The fundamental factors of ventilation are humidity, movement, and temperature of air, not oxygen, carbon-dioxide, and organic matters. Of course, the relative exercise of the occupants, physically, the relative freedom from disease microbes, freedom from dust, freedom from odors, etc., figure slightly but are cared for largely by the humidifying arrangements mentioned.

For the ideal summer school, we should want for this plan a building something like a cold-storage plant. Thick concrete, brick, stone or other such walls, sun-protecting roof such as heavy tile, cement or composition floors, probably double-glass windows admitting light but no air and permitting comparatively no cold to escape nor heat to enter. The building would be made cold on the inside and kept cold by every means possible; ventilation would be secured by the recirculation system; and ice, circulation of cold water or freezing solution in pipes and radiators, cold water shower for humidifying the air, closed doors, etc., would provide a building where it would be as delightfully cool and stimulating to work in summer as in winter. Man has done much to adapt winter weather to his needs by means of heating systems and cold-proof buildings. He has largely failed with the summer problem. Yet he claims that individual and social happiness and efficiency are the goal of life and that people should be happy and efficient even in summer. Rapidly increasing competition and humanitarianism will speedily secure trials of this hypothesis also. When one sees a whole school full of pupils, or students, and teachers sweltering unnecessarily, when he goes into office and factory buildings that fry the life and spirit out of men and women at work, or when he goes to a beautiful, large church of solid stone, ideally fitted for the recirculation installation, yet poor in ventilation and comfort in summer, he experiences a bitter feeling at man's inventive failure.

Cool, open chairs should also be provided, preferably with perforated seats. Have you ever sat down in a hot chair in summer time and stuck fast? Perforated seats and open backs prevent this. Where the building is cooled, either by the closed-building or open-building plan with accessories, the hot seat would not be possible, but we are suggesting modifications for buildings that carry out the plans fully or at least modify one or more features. These seats should be single chairs, moreover, since such arrangement provides for more circulation of air and less crowding.

The heat-regulating mechanism of the skin must be as much open to the air and in as clean, open-pored condition as possible. It is unfortunate that the winter dominates the summer as to styles, at least for men. Even in the tropics here men wear coats and vests and are afraid to appear in shirt sleeves. Tropical women are more sensible, and northern women wear thin clothing and expose more of the skin surface to the air than man. Low-neck dresses, sleeveless, with ventilated chest, and with short skirts and thin stockings, help them to better health and comfort in summer.

However, thin linens, silks, or near-silks, palm-beach, duck, mohair, and other cloths are becoming more common. American men are freer than tropical gentlemen to discard the heat-holding vest in summer and far more accustomed to going in their shirt sleeves, using belts instead of suspenders. May their tribe increase! The problem is to meet, or change, the requirements of custom and at the same time meet those of health and comfort. The latter cannot be changed. The former can, slowly. Inventive genius is needed for producing very light, porous, cool cloth that will look well, keep clean, hold its shape, and permit the free access of air to the skin. If men in summer could only evade the tight, starched collar and wear low-neck shirts, what a great deal of comfort and efficiency would be added to the lives of millions of their sex in summer. White-duck and other cool and easily washed fabrics are much used in tropical climates. Duck is cheap, fairly cool, and reflects the rays of heat. Light-gray or tan colors could be produced which would remain unsoiled longer. We wait for experiment and invention in clothing also.

But the male summer student very frequently comes to class with a high collar, heavy coat and vest, heavy high shoes, instead of low ones and a general winter, but not summer, make-up.

Not only should the outward environment be made cool and cooling in the heat of summer, but the body must be kept in good condition to stand and get rid of such heat as there is. First of

all, the skin must be kept in good condition by baths. The school should furnish shower baths and swimming pools for both sexes. In tropical climates or places where there is little freezing weather, outdoor swimming pools should be very common. On the great South-Park playgrounds of Chicago such pools add new life and joy to hundreds of thousands of persons each summer. An indoor pool of course can be used both winter and summer. One of the most delightful features of the summer school at the State College on the heated plains of Kansas, for example, is the large, cool swimming pool. The value of such a provision for comfort and health has been sadly overlooked in most educational institutions. One of the first appropriations made by institutions intending to run a summer school should be the provision of swimming pools.

V. OPEN-AIR SUMMER SCHOOLS

Study halls, libraries, laboratories and other research rooms should in summer be kept as cool as possible. Much study and many recitations should be out-of-doors. For this purpose, much shade and many comfortable benches are desirable. I have seen no summer school with sufficient out-door seats, in fact in no place one-twentieth as many as were needed, unless one would count some of the outdoor theaters. Long pergolas reaching from building to building over the walks or at the side are desirable. With concrete posts and red-tile roofs they can be made very decorative, but there are much cheaper ways, such as high posts with "chicken wire" and vines at sides and top. When rains come, these afford protection, especially those of the closed-roof type. In the tropics, where rains are frequent at certain seasons they are very necessary. The open-air-study-habit should be cultivated in students in summer and can best be cultivated by providing open-air facilities. Few institutions have even sensed the need, it seems. As before suggested, many classes can be taught beneath the shade of trees, or roofs, of some kind put up for the purpose. The open-air-school plan is possibly as good as the open-building or closed-building plans described. Usually the regular buildings must be used and adapted to summer conditions.

Of course, at all such schools plenty of drinking fountains kept in good condition and furnishing cool and pure water are of immense value. They should encourage students to drink sufficient water, not make it hard for them to get water. Most sum-

mer students drink too little water for health as constipation and other records of physicians show.

Many more suggestions relating to mental hygiene and "keeping cool" mentally, the kinds of food which students should eat in summer, the use of the early hours from three or four o'clock A. M. for study, with a siesta during the early afternoon heat, the provision of comfortable sleeping rooms, tents, open-air dormitories for summer, the location of the summer school with reference to lakes, streams, mountains, etc., all clamor for attention here, but we have exceeded our space and your attention perhaps.

In the good old days of ancient Greece and Palestine, the great teachers taught in the open air out in the groves. It is high time that our summer schools gain some of this wisdom of the ancient teachers who have not been excelled in modern times.

THE REPORT OF THE COMMISSION ON MILITARY TRAINING IN NEW JERSEY

BY LAWRENCE AUGUSTUS AVERILL
Editor of The American Journal of School Hygiene

To the original study of the advisability or the inadvisability of introducing a system of military training into the public and high schools of this country, which was reported in 1915 by the Special Commission on Military Education and Reserve of Massachusetts, there is now available for citation another study conducted by another eastern state of the same problem. I refer to the Report of the Commission on Military Training and Instruction in High Schools, made at the 1917 session of the State Legislature of New Jersey by the special delegation named in 1916 to make an exhaustive inquiry into this much mooted question. It appears from the Report, that the Commission sought to obtain all available information bearing upon the subject under investigation, extending their reasearch to include a survey of all plans of military instruction followed in this and in other countries. In addition, it made a special study of the much-talked-of military instruction offered to the pupils in the high schools of the State of Wyoming. The Report in which the final conclusions drawn by the Committee are published represents a masterly analysis of the present undeniably strong agitation for the introduction of military training into the secondary schools.

Under the chairmanship of Mr. Oswald Garrison Villard, editor of *The New York Evening Post,* the recently organized *American Union Against Militarism* is devoting itself to opposing vigorously the attempt to organize in this country a permanent system of universal military training and service. Among other activities, the *Union* is reprinting the New Jersey report *in toto,* and circulating it widely throughout the states in the hope that its sane and judicial sentiments in the matter may, to a certain extent, at least, counteract what the *Union* characterizes as "local newspaper hysteria" on the subject of intensive military training in the public high schools.

With the exception of a few introductory considerations, the Report made to the New Jersey Legislature follows:

. . . . . Thus far we have considered the proposition of juvenile military instruction as involving the separation of the boys of the State into two classes, viz., those attending the high schools and those not attending these schools, and have given specific reasons for concluding that it is not advisable to use only the former for military purposes. There are, however, many important considerations of a general character, which apply with especial force not only to the military training of high school boys, but to that of all boys in all secondary and elementary schools, and which must be mentioned in this report.

It is specially significant that none of the great nations of Europe, in which the military service of adults has been universal and compulsory, and which have shown phenomenal efficiency in the present war, has thought it necessary to resort to the military training of its boys. With the most instructive and convincing example of these nations before us, does it not seem incomprehensible that our State and National Government should seem to shrink from the compulsory military training and service of adults and at the same time prefer to consider the imposition of compulsory training upon minors, whose dependent condition prevents the possibility of the refusal of such training? Even the federal military system of Switzerland, which exacts compulsory service from men over twenty years of age, and which is looked upon with much favor as being peculiarly adapted to a republican form of government, does not impose compulsory training upon school boys.

Military authorities are by no means united in its advocacy. General Leonard Wood has recently said, "Personally, I do not believe we should give the training until the year in which the youth becomes 19." General Baden-Powell said, "Drill a school boy and spoil a soldier."

The military training of boys gives no assurance that they will enter military service voluntarily when they become men. It is well known that comparatively few of those who have been members of school cadet corps enlist as members of the National Guard. The recent experience of Australia is significant. Although it has for some years had compulsory military training for males between fourteen and twenty-six years of age, and its people might consequently be regarded as prepared and zealous for service, the number of enlistments in the present war has fallen far short of the expectations and requirements of Great Britain. Furthermore, the people by referendum last fall rejected the proposition to adopt conscription or compulsory serv-

ice in the greatest crisis in their history. On the other hand, in our Civil War, New Jersey, without preliminary training of any kind, either of men or of boys, furnished 10,000 more men without conscription than the National Government required.

Training in the real work of the soldier, to be of value, should be conducted under conditions which are as nearly like actual war conditions as it is possible to make them, and should include such operations as entrenching, marching with full service equipment, all the activities of camp life, abundant practice in the use of weapons—rifles, bayonets, grenades, machine guns, artillery of all kinds. It must be admitted that boys of high school age cannot undergo practical training of such a strenuous character with any hope of success, and, it must also be said, without fear of serious injury. At the same time, it ought to be said that much of this work of real training could not be done because of lack of facilities.

It is sometimes claimed that military training is the best agency for inculcating obedience. But if this claim is carefully considered it will be found that obedience to military authority is generally unthinking. It is often blind and superficial, not real. During actual war men willingly undergo training because the work is definitely motivated; but when peace comes and men go into barracks, they feel that there is nothing of value in drill and there is a consequent tendency to evade its requirements. This kind of obedience has been and may be secured by similar school methods. It is obedience under restraint. When this is removed, laxity in discipline often follows. The discipline of the schools aims not at isolated acts of obedience under special circumstances, but at the *habit* of obedience to elders and persons in authority. It is a psychological fallacy to suppose that obedience to military authority, indeed, obedience exacted under any peculiar circumstances, may automatically be translated into the general habit of obedience. The same may be said of such qualities as alertness, promptness, industry, truthfulness, etc. *It is by no means capable of demonstration that those who have had military training, or been subject to military discipline, are superior to other citizens in the possession of these qualities.*

The development of patriotism in our youth is sometimes urged as a reason for introducing military instruction in the schools. Military forms and observances may furnish opportunities for the manifestation of patriotic feeling, but they cannot be regarded as its cause. They cannot even always be regarded as evidences of its existence. There are more effective, more certain methods of

teaching real, intelligent patriotism. Emphasis must be placed upon the study of our country's history, of its social and economic development and relations, of its principles and institutions, of its provisions for the prosperity, happiness, and welfare of its people, and of its civic and social life, and not upon such a single, narrow activity as military instruction.

Obedience, patriotism, orderly behavior, and other desirable traits which have been or might be mentioned, are not results peculiar to military training, nor are they qualities which belong peculiarly to military service. They are qualities which every upright, useful citizen ought to possess, and which it is the aim of all school discipline and school exercises to develop and train. Instruction in them is ethical and moral, not military. It is only by impressing upon pupils the truth that they are necessary in all walks of life, and not only in the military sphere, that this kind of instruction may be made universal and thorough.

The education of the schools is fundamental and aims to train pupils for life. For this purpose the whole school period is needed. Real military instruction includes exercises of a highly specialized character and aims at specific purposes which are unduly emphasized and are thus likely to draw the pupil's attention away from the chief purpose of his education. Military training must aim at military service, but military service will not be the chosen occupation of many boys.

Observations made by the Commission in Wyoming are particularly significant:

It is to the class of military drill that the Commission would assign the practice in the high schools of Wyoming, which, as has been said, members of the Commission observed. In all the cities of the State the membership in the cadet corps numbers only about three hundred. Very little, if any, of the instruction belongs to the category of real military training. No evidence of regular, persistent rifle practice, or of instruction in the activities of military camp life was found. On the other hand, experience in these activities has been very desultory. Nearly all the exercises are those which are commonly performed on the parade ground or in school halls, and are characteristic of the school cadet corps with which all are familiar. Special attention has been given in some schools to "wall scaling," an activity which seems military in character, but which in the actual performance is a purely acrobatic exercise. There is no reference to the ultimate purpose which it ought to serve and for which it is prac-

ticed in the army. As conducted in the schools of Wyoming it aims at physical agility and perfection in team work, stimulated by the keen competition which is encouraged and must be regarded as belonging to the domain of physical training. No systematic plan, followed generally by all the schools, could be discovered; indeed, it is difficult to conceive of any well organized State plan for systematic military training in a commonwealth where only one high school employs a physical and military training instructor, and where the supervision of the drills in all other high schools is delegated to one of the regular teachers, who is paid a small additional compensation for his services. In one city wall scaling was the predominant activity, while military drill was regarded as subordinate. In others the latter was emphasized, while wall scaling was neglected. In one school membership was compulsory for all able-bodied boys, in the others it was voluntary. There was no similarity in the uniforms adopted. In one school the cadets wore a naval uniform. In one school both boys and girls were required to wear uniforms constantly during school sessions. The requirement that girls should wear uniforms was due to social reasons, not military. The practice of enlisting girls as "sponsors" seemed not generally followed. Where the practice was observed, the girls were not instructed in first aid, bandaging, and other duties commonly considered appropriate to girls, but were expected to attend the drills and other exercises for the purpose of influencing the personal demeanor of the cadets and stimulating them in their work. While instructors and cadets showed great enthusiasm, the narrowness and monotony of the instruction were clearly demonstrated by the abandonment of wall scaling in two schools, one of which had made a record for rapidity, and the abandonment by one important city, whose high school maintained a cadet corps for several years, of the whole plan of military drill. It should be noted that the University of Wyoming, located at Laramie, which gives compulsory military instruction to its students with national aid, has not organized a cadet corps in the high school connected with its normal department. On the whole, while training of a special character may in some cases give special bent or inclination, the exercises of these schools have little military value. At the same time, information which we received proves that the special stimulus to habitual correctness of personal conduct, which military drill is claimed to give, has no exceptional force. We must commend the enthusiasm of those who organized the cadet corps in the several cities and have maintained the instruction in them,

and the high ideals of physical attainment and of ethical conduct which they inspire the cadets to try to reach, but we are forced by our observation to conclude that better and more lasting results in these directions can be secured in other ways.

If the State should be inclined to consider this form of training, notwithstanding its deficiencies, it should keep in mind the cost. During the year 1915-1916, 46,103 pupils were enrolled in the high schools of the State, of whom 24,716 were girls and 21,387 were boys. If we eliminate boys who are under age or physically unfit, we should still have available for compulsory training many thousands for whom equipment and instructors would have to be provided. It is clear that the plan would cost many thousands of dollars each year, while the results obtained would be comparatively negligible so far as real military purposes are concerned. It is not necessary, however, for this State to incur the great expense involved. In accordance with Section 56 of the Act of Congress, approved June 3, 1916, and with General Orders No. 48 of the War Department, dated September 19, 1916, the Secretary of War is authorized to supply military equipment and instructors for purposes of military training to schools under certain conditions. Congress has thus recognized the propriety of handling the matter nationally and relieving the States of the expense. We are informed that Congress has not as yet made adequate financial provision to carry the act into full effect. Whether legislative action by the State is necessary to authorize the schools to apply the act is a question which should be determined by legal advice. At any rate, if such action is necessary, we do not recommend it, because, for reasons which have been made clear, we do not favor the introduction of any form of military training, as such, into the schools.

While military drill is acknowledged to be inadequate for military purposes, advantage is claimed for it as a means of character development, of strengthening those desirable personal qualities which are assumed to be peculiar to the soldier, and as a means of furnishing exercise or physical training. We have already pointed out that the development of character should be and is the object of all school exercises, and that the assumption that military exercises furnish the only or the best means of securing it has no foundation. *No evidence has ever been presented which demonstrates that members of the school cadet corps are better morally or are more free from moral defects than other school boys.*

As a sole means of physical training it is condemned almost universally by experts in that subject. Dr. Sargent, of Harvard University, says, "It is not an adequate means for physical training, being not only very limited in its activity, but actually harmful in its effect on boys less than eighteen or twenty years of age. It does not offer sufficient opportunity for the development of the individual's powers of muscular and mental coördination, and the exercise of judgment under unusual and trying circumstances." Dr. Ehler, of the University of Wisconsin, says, "Military 'drill' is an enthusiasm-killing, contempt-developing treadmill. Preparedness involves * * * primarily and fundamentally the possession of vitality, endurance, integrity of structure and function of every organ, alertness, bodily skill, self-control, hardihood, courage—in other words, the fullest development of the physical, mental, and emotional powers, the result of real physical education * * * . Let us not confound drill with training, nor substitute 'military drill' for physical education."

The difficulty experienced by all military companies organized in schools, in which membership is voluntary, in retaining their members, and the frequent disbandment of such companies, testify to the monotony of their work and their failure to offer permanent attraction to the young.

But in the matter of genuine physical training, in the full realization of the tremendous importance of the development and maintenance of the bodily vigor of boys and girls, of men and women, in the systematic and persistent training of all the members and organs of the body to perform their functions accurately and successfully, in the desire to maintain a nation of healthy people, we are all on common grounds.

Military authorities admit that the fundamental aim of every form of military training must be to cultivate physical health and strength. As Dr. George Fisher, Secretary of the Physical Department, International Committee, Y. M. C. A., and New York State Military Training Commissioner, puts it, "In the training camps in England it takes a full year to get the men in condition after they enlist. England's experience in this war indicates that the big problem is not primarily the training of the men in military tactics or drill, but conditioning the men. Therefore, the lesson to us should be to discover what methods can best be used to put and keep men in good physical condition."

If any evidence of the accuracy of this opinion were needed, it is necessary only to consult the records of the United States War Department. The Surgeon-General has courteously supplied us

with the following statistics concerning applicant for enlistments in the United States Army:

Number of applicants for enlistment in the United States Army, furnished by the several recruiting districts, together with the number accepted or rejected in said districts, fiscal years ending June 30, 1911 to 1915.

Fiscal years ending June 30	Total Number of Applicants	Accepted		Rejected	
		Number	Per cent of total Applicants	Number	Per cent of total Applicants
1911	136,978	29,041	21.2	107,937	78.8
1912	149,693	31,587	21.1	118,106	78.9
1913	123,664	21,268	17.2	102,396	82.8
1914	168,527	35,902	21.3	132,625	78.7
1915	168,842	39,245	23.2	129,597	76.8
Total for 5 years	747,704	157,043	21.0	590,661	79.0
Annual average	149,540	31,408	----	118,132	----

Note.—These only include applicants accepted at recruiting stations. They are then sent to Recruit Depots where they are further critically examined by medical officers.

It will be noticed that these statistics are based on preliminary examinations at the recruiting stations, and do not include the final examinations which reduced still further the number of men accepted.

Of 41,168 who volunteered for enlistment in 1915 in the U. S. Marine Corps, only 3,833, or about nine per cent, were accepted.

Of the men who were in the National Guard of the States when mobilized on the Mexican border last year and mustered into the United States service, all of whom had been subject to military training and service and were assumed to be physically fit, thirty per cent had to be discharged because of physical disability.

It is evident that even if the training of our youth had military service only as its aim, that training should be physical, not military.

On the other hand, all the statistics furnished by the reports of medical experts in connection with the medical inspection of

school children and college students in all countries, of the medical examiners of life insurance companies, and of all organizations for whose employees a sound body and health are requisites, testify unanimously and strongly to the wide prevalence of serious physical defects, which greatly interfere with the efficient and satisfactory performance of the duties of civil life.

In order, therefore, that all citizens may be properly trained and prepared to perform effectively all their duties, no matter what they may be, we recommend and strongly urge that the necessary steps be taken to provide for all the schools of the State a complete and thorough system of physical training. This system should be compulsory on all pupils, and should include carefully selected exercises adapted to the different ages of pupils and designed to protect their health, stimulate bodily functions and promote physical strength. It should apply to all girls as well as boys. It should aim to prevent bodily abnormalities or deformities, or to correct them, if they are found to exist. It should include personal and community sanitation, first aid in emergencies, bandaging, and all forms of instruction in personal safety. It should encourage outdoor activities. It should provide abundant games for all pupils in which group activities are prominent and in which appeal may be made to the spirit of competition. It may include those features of military drill which properly serve the purposes of physical training, but which must be regarded as subordinate to these purposes. It may even include practice with the miniature or the service rifle, if such practice is regarded as necessary to develop steadiness of nerve, bodily control and accuracy of sight. In the case of such exercises the educational error does not lie in their use, but in the exaggerated military purpose which they are made to serve. All the features and exercises of the thorough course of physical training which we recommend should be intimately connected and interrelated, on the one hand, with the moral or character forming instruction of the schools, and, on the other, with the complete provisions for medical inspection which have already been made compulsory by law.

With the findings of the Commission this JOURNAL is in most hearty accord. It is not military instruction or drill as such that our public schools are crying for today. It is not the glamor of uniform and gun and sabre. It is rather a thorough system of school health work and physical training that our boys and girls stand most in need of today. As a people we have too long neglected the *normal* means of guaranteeing health, vitality and

vigor to our children; now, when the din of battle resounds and militarism struggles to maintain its last hold upon an outraged and indignant world, we would conjure up one of its imps and thus attempt *abnormally* and artificially to atone for that which our negligence and short sightedness has caused us to overlook, namely: the basic and fundamental principles of health and vitality which are the cornerstone and keystone of eligibility to any form of effort, civic or military.

BETTER SCHOOLHOUSES AS A FACTOR IN RACE BETTERMENT

BY J. H. BERKOWITZ

Special Investigator, Bureau of Welfare of School Children, New York Association for Improving the Condition of the Poor.

Secretary, Sub-committee on Plan and Scope, Committee on Standardization of Schoolhouse Planning and Construction, Department of School Administration, National Education Association.

INTRODUCTORY NOTE

To a very great extent the foundations of national vigor are built on the physical environment of childhood during school life. Unfortunately the number of school boards and individual school officials who are yet to be convinced of this is not small. Many are the schools in which children are compelled to receive daily instruction under conditions that would be condemned in industrial plants where sturdy adults are employed. In such schools compulsory education spells compulsory physical unfitness. "Millions of dollars are wasted every year in schoolhouses that are ill-adapted to their uses because there are as yet no standards to which school committees can refer with confidence. Every locality is today working by its own experience and to a large extent blindly." The quotation is from the first report of progress of the Committee on Standardization of Schoolhouse Planning and Construction, presented at the National Education Association Meeting at Portland, Oregon, in July, 1917. The interest manifested throughout the country in the work of this Committee has shown that there is a widespread sentiment for remedying the reckless and wasteful construction of schoolhouses. At the convention of the National Education Association held in New York City in 1916, the Department of School Administration established a Committee on Standardization of Schoolhouse Planning and Construction, whose purpose is all that its name can possibly imply. That the Committee is not concerned merely with architectural technique but rather with the broader conception of

a schoolhouse in its relation both to educational principles and to the physical well-being of its occupants, may be gathered from the following remarks made during the discussion of the Committee's second report of progrress at the 48th Annual Meeting of the Department of Superintendence, National Education Association, Atlantic City, N. J., February 27, 1918.

Perhaps all has been said that possibly could be said about the standardization of school buildings mainly with regard to space on a per-pupil basis and cost consideration. I should like to add something with reference to the more purely human elements which enter into the committee's work. Such elements must be considered inasmuch as the architectural requirements of school buildings also involve those of hygiene and sanitation. It would not be just that the impression go abroad that this committee is endeavoring to standardize school architecture, pure and simple, so I trust I may be permitted to define the aim of the committee as being to standardize the planning, construction and equipment of schoolhouses in any and all respects which will provide adequate accommodation and wholesome environment.

The school architect alone to whom the planning of a schoolhouse to meet local needs is often left, is not always in a position to consider those problems which are properly within the realm of the hygienist, the sanitarian or the school administrator, or of all three at once. Nor are local authorities whose business it is to provide schoolhouses always sufficiently informed to enable them to lay before the architect a comprehensive program for which he is to make provision in the schoolhouse. Neither the school board nor the school superintendent nor the architect alone can determine exactly what the requirements are for the safeguarding and promotion of the children's welfare.

In these days of world conflict, the realization has been brought home forcibly and sadly to many who have never before given any thought to the question of how much the schools of the country might contribute toward the physical betterment of the race through prevention alone. Much has been said and much more remains to be said, as it no doubt will be, about the large percentage of young men disqualified from military service by reason of physical defects. Some of these defects are such that could be prevented, or at least reduced, during school life. Is it not a sad commentary on the social conscience of this nation that nothing less than the world war could rouse it sufficiently to be interested in this problem of preventable physical defects? We might

at least have profited by the experience of England if not from the foresighted policy of Germany. It is well known that the improvement of school buildings, the promotion of school hygiene and the practice of school medical inspection in Germany date back very many years, and it is equally well known that the impetus for similar work in England came within recent years, and chiefly as a result of the conditions disclosed by the examinations of young men for service in the Boer War. We are going through the very same experience now, and while some of us are shocked by the conditions revealed, others have the poor gratification of saying "We told you so."

Our problem then in the standardization of school buildings is not merely to beautify our architecture or to beautify our cities, much as that is desirable, but to better and beautify the generation now growing up, or at the threshold of life—the coming race. The school must be a model for living conditions, not only for study conditions. By example and through practical application, a child must be taught to understand and to seek in his home and outside his home, the same health protective conditions that he finds in the school. He must learn to appreciate wholesome environment. A child must acquire the habit of using his eyes properly in the school, and he will not misuse them elsewhere; he must acquire the habit of sitting properly in the school or he will not acquire it anywhere else; he must acquire the habit of keeping himself cleanly or he will not acquire it elsewhere, certainly not where the environment does not suggest or inspire it.

It is well enough for a schoolroom to be provided with adequate light inlets, to take one of the many elements which make up the problem of schoolhouse planning and construction, but it is certainly equally important that facilities provided should be properly maintained and used. The architect might be guided by the standard rule of allowing a window area equal to one-fourth or one-fifth of the classroom floor area, with a consequent sufficient supply of natural light, but what of the danger which lies in excessive light when means of control are not regulated or when such control is not enforced? What of the danger to children's eyesight when exposed to glare and direct rays of light which must produce eye strain? Having provided our school administrators and school boards with model buildings, it must then rest with them to use those buildings as they are intended to be used. I know of instances where classrooms were planned and built properly only to be so managed or misused as to constitute a menace to the children as well as to the teachers occupying

them. In one case, for example, since I have touched on the question of light, in a classroom which if properly utilized, would have come up to the highest standards, the pupils' desks were placed facing an East window, with the blackboards beneath that window, yet the plan of that room, the position of windows and the wall space were such that the desks could have been placed so as to have the light come from the left of the children as it properly should be. Now any educational system in which the person responsible for such conditions is allowed to display such disregard of the elementary requirements of school hygiene, is a defective system. The problem is an educational one as much as a health problem.

In the course of my investigations made for the Bureau of Welfare of School Children of the New York Association for Improving the Condition of the Poor, and which I believe was the basis on which the chairman honored me with membership on this committee, I found that proper maintenance was half the solution of the problem of better school housing. I speak of school *housing* because there are twenty million children who are strictly speaking housed in the schools throughout this country, living in those schools, one might say, because they are there the greater part of the day-time or work time, and in very many localities spend in the schools much of their after school and recreation time. Proper housing signifies adequate space for the various uses to which a building is put, safeguards for the safety of the occupants, sanitary conveniences which will tend to promote and not endanger health, equipment which will help maintain hygienic conditions and making for comfort and cheerfulness.

It is not enough that the architect has so planned a schoolhouse as to provide ample light, sizable classrooms, adequate space for all activities to which the school is dedicated, safe and sufficient hallways, stairways and exits and such other items which go to make up a good schoolhouse. Care must be taken that all of these be properly used. Children's eyesight must be protected through the proper control of light inlets, the proper placing and maintenance of blackboards and such other details which if disregarded are contributing causes of defective vision. Too much attention cannot be given to the type of desks and seats used, their placing and their adjustment so as to permit of comfort and to minimize the chances of poor posture being developed. Whatever system of ventilation may be installed, its effectiveness is reduced, even destroyed, if intelligent co-operation between teachers, engineers, janitors and superintendents does not exist, to the

end that all regulations necessary for the proper operation of the ventilating system are rigidly observed. Drinking fountains must be provided of such type of construction and operation that they will not serve as a medium of contamination and the spread of disease, and surely no fountain may be considered sanitary unless it is kept in a sanitary condition. The other factors of school hygiene into which the question of maintenance enters as prominently as that of construction are too numerous to discuss here.

In conclusion it might be said that whenever the labors of this committee are completed and recommendations made which, in the committee's judgment, will constitute a standardization of schoolhouse planning and construction, the problem of school housing will not be solved until school administrators adopt such means as will insure the proper maintenance of their schools. No school is administered to the highest degree of educational efficiency unless it is also maintained to a maximum of efficiency in the promotion of the physical welfare of the children housed in that school.

DEFECTIVE NUTRITION AND GROWTH

A SELECTED BIBLIOGRAPHY

By FRANK A. MANNY, Cambridge, Mass.
Formerly Director of Nutrition Study, Association for Improving Condition of the Poor, New York City.

Poverty that makes a man "look like a lantern all his life after." PIERS PLOWMAN.

"Old men bear want of food best; then those that are adults; youths bear it least, most especially children and of them the most lively are the least capable of enduring it." HIPPOCRATES.

"Defective nutrition stands in the forefront as the most important of all physical defects from which school children suffer. No class of children requires more careful 'following up' and re-examination. All children suffering from malnutrition should be weighed at intervals of one to three months."

SIR GEORGE NEWMAN,
Chief Medical Officer, England and Wales.

"The health department has no duty more important than that of identifying the ill-nourished children, and the school department no more urgent duty than that of ameliorating their condition.

"Children of this class more than any other need constant health supervision. They are the ones most injured by poor ventilation, bad lighting, lack of opportunity for play. To look after their welfare is far more important than the control of contagious diseases, important as that may be." CUBBERLY.

"There is no investment comparable to this, no national economy so fundamental; there is also no waste so irretrievable as that of a nation which is careless of its rising generation."

SIR GEORGE NEWMAN, 1916.

"The principal business of a policeman at present is to prevent hungry children from obtaining food. The proper primary business of a policeman is to seize every hungry child and feed it, to collar every ragged child and clothe it, to hand every illiterate child over to those who will teach it how to read and write."

GEORGE BERNARD SHAW.

I. GENERAL—REPORTS, STUDIES, FEEDING, STANDARD OF LIVING, ETC.

ACLAND.

Sleep in relation to growth, development and work, P. N. E. U. (England) report, 1905, p. 496.

ARKLE, A. S.

The condition of Liverpool school children—three papers 1907. Tinling, Liverpool.

AYERS, LEONARD P.

Open air schools, New York, 1910.

BAKER, S. JOSEPHINE.

The Division of child hygiene of the department of the city of New York. Monograph series, August, 1913.

The Bureau of child hygiene of the department of health of the city of New York. Monograph series, January, 1915.

BOOTLES (ENGLAND)

Report of the medical officer, 1915.

BOSANQUET, MRS. BERNARD.

The Standard of life. Macmillan, 1899.

BRADFORD (ENGLAND) EDUCATIONAL COMMITTEE.

Returns as to the pecuniary circumstances of 966 families whose children have been provided with meals under the Education act (1908).

Report by the medical superintendent, Ralph E. Crowley, on a course of meals given to necessitous children from April to June, 1907.

BRITISH INSTITUTE OF SOCIAL SERVICE.

(Reports result of rejection of candidates for service in Boer War.)

Royal commission on physical training, Scotland (1903).

Interdepartmental committee on physical deterioration (1904). (See comments in Independent 60: 868—9.)

Interdepartmental committee on medical inspection and feeding of children attending public elementary schools (1905).

Select committee on the provision of meals bill (1905).

BROUGHTON, H.
The open air school. London, 1914.
BRYANT, LOUISE STEVENS.
School feeding: its history and practise at home and abroad. (Bibliographies on malnutrition and school feeding). Lippincott, 1913.
BRYCE, ALEXANDER.
Modern theories of diet and their bearing upon practical dietetics. Longmans, 1912.
BULKLEY, M. E.
The feeding of school children, Ratan Tata Foundation. London, 1914.
BURLINGHAM, CHARLES C. ET AL.
New York Committee on physical welfare of school children. Physical welfare of school children, an examination of the home conditions of 1400 New York school children, found by school physicians to have physical defects. American Statistical Association. June, 1907.
CAMPBELL, HARRY.
The evolution of man's diet. *In* G. A. Sutherland, A system of diet and dietetics, London, 1908.
CANNON, WALTER B.
Bodily changes in pain, hunger, fear and rage. Appleton, 1915.
CHAPIN, ROBERT COIT.
The standard of living among workingmen's families in New York City, Charities publication committee. 1909.
CHILDREN BETWEEN TWO AND SIX.
The public health nurse quarterly, July, 1915. p. 28.
CHITTENDEN, R. H.
Physiological economy in nutrition with special reference to the minimal requirements of the healthy man; an experimental study. Stokes, 1904.
CORNELL, WALTER S.
Health and medical inspection of school children, Davis. Philadelphia, 1912.
Medical inspection of public schools in annual reports of Bureau of Health of the city of Philadelphia.
CROWLEY, RALPH E.
The hygiene of school life. London, 1910.
DAVIS, MICHAEL M., JR.
Food in families of limited means. Survey, January 12, 1918.

DRUMMOND, W. B.
An introduction to school hygiene. London, 1915.
DUBLIN, LOUIS A.
Mortality of children, Quarterly Am. Stat. Ass'n. March, 1918.
EAVES, LUCILE.
The food of working women in Boston, Women's Ed. and Ind. union, Mass. department of health, 1917. (Bibliography 32 titles.)
EDINBURG CHARITY ORGANIZATION SOCIETY.
Report on the physical condition of 1400 school children in the city together with some account of their homes and surroundings. London, 1906.
EMERSON, WILLIAM R. P.
The class method in the dietetic and hygienic treatment of delicate children. Pediatrics. September, 1910.
Measured feeding for older children. Boston medical and surgical journal, January 15, 1914.
Food habits of delicate children. New York medical journal, February 24, 1917.
The delicate child. Little wanderer's advocate. Vol. LII, No. 2.
Results of treatment of the defects found in one hundred consecutive children admitted to the New England Home for Little Wanderers. *In* Little wanderer's advocate, Vol. LIII, No. 2, and in International clinics, Vol. II, series 27.
Record book for measured feeding. F. H. Thomas Co., Boston.
FISHER, IRVING.
Report on national vitality. Government printing office. Washington, 1909.
GASTPAR, DR.
Die Beurteilung des Ernährungszustandes der Schulkinder Zeitschrift für Schulgesundheitspflege, 1908, p. 689-702.
GORST, SIR JOHN.
Physical deterioration in Great Britain. North American Review, July, 1905, p. 1.
GILLETT, LUCY H.
Food allowances for healthy children, A. I. C. P., New York City, 1917.
Food for the family, A. I. C. P. New York City, 1917.
The relation of food economics to the nutritive value of diet, National conference, charities and correction, 1917.

GRANT, PERCY STICKNEY.
Physical deterioration among poor in America. North American Review, 184, 254.
GRULEE, C. G.
Nutrition. Unsettled problems in regard to the nutrition of children. *In* Child in City, Child Welfare exhibit of Chicago. 1912. pp. 107-12.
GUEST, L. HADEN.
The nation of the future. London, 1916.
HALL, W. I.
Nutrition of children under seven years of age. *In* Child in City, Child Welfare exhibit of Chicago, 1912. pp. 80-90.
HERON, DAVID.
Influence of defective physique and unfavorable home environment on the intelligence of school children. Galton eugenics laboratory memoirs VIII. 1910.
Mental defect, malnutrition and the teacher's appreciation of intelligence. Cambridge University Press, 1911.
HOAG, E. B.
The health index of children. Whitaker, 1910.
HOAG & TERMAN.
Health work in the schools. Houghton Mifflin Co. 1914.
HOFFMAN, FREDERICK L.
Some vital statistics of children of school age. Fourth international congress on school hygiene, Vol. IV, pp. 109-119.
HOGARTH, A. B.
Medical inspection of schools. London, 1909.
HOOKER, E. B.
The malnutrition of school children and its physical and social consequences. Clinic (Chicago) 27: 577-86, 1906.
HUNTER, ROBERT.
Poverty, New York, 1904.
HUNTINGTON, ELLSWORTH.
Civilization and climate, Yale University Press, 1915.
JONES, G. E.
Tuberculosis among school children. Pedagogical seminary. March, 1914.
JOSEPH, G. W. N.
Nutrition and malnutrition, Report of medical officer, Warrington, England, 1916.
KAUP, J.
Die Ernährungsverhältnisse der Volkschulkinder. Berlin, 1909.

KERR, JAMES.
Standard measurements for school children. Am. Jour. Sch. Hyg., March, 1918.
KELYNACK, T. N.
Defective children. London, 1915.
KINGSLEY, SHERMAN C.
Open air crusaders: a report of the Elizabeth McCormick Open Air School. Chicago, 1910.
LANCET REPORTS.
The free feeding of school children (France, Belgium, Italy, etc. London, 1907.)
LARKIN, F. E.
The influence of wages on the child's nutrition. The Medical Officer. December 17, 1910. p. 347.
LINDSAY, DOROTHY E.
Report upon the study of the diet of the laboring classes in the City of Glasgow. University of Glasgow, Physical department. 1913.
LICHTENFELT.
Die Geschichte der ernährung Kap. II Ernährung und volksgesundheit. Berlin, Reimer, 1913.
LOCKE, E. A.
Food values. Appleton, 1916.
LONDON COUNTY COUNCIL.
Education Committee. Handbook containing general information with reference to children's care (second edition, 1912).
Home circumstances of necessitous children in twelve selected schools. No. 1203, 1908.
Annual reports of medical officer, education department, public health.
LUSK, GRAHAM.
Fundamental basis of nutrition. Yale university press, 1914.
Food in wartime. The Scientific monthly, October, 1917.
MACKENZIE, ALISTER.
Annual reports, medical inspection, Dunfermline, Scotland, 1906, on.
MACKENZIE & FOSTER.
Report on a collection of statistics as to the physical condition of children attending the public schools of the school board for Glasgow. 1907.
MCCASKEY, D.
Vitamines and cooking. Scientific monthly, October, 1915. p. 379.

McMILLAN, MARGARET.
The camp school, London. 1914.

MANNY, FRANK A.
A comparison of three methods of determining defective nutrition, Archives of Pediatrics, February, 1918.
Defective nutrition and the standard of living, Survey, March 20, 1918.
Indexes of nutrition and growth, The Modern hospital, November, 1916. (Contains bibliography on indexes of nutrition and physical development, 38 titles, work of Crampton, Oppenheimer, Pryor, Rotch, Schuyten, Stiller, et al.)
Medical inspection reports in Great Britain, Educational review, April, 1916.
Nutrition clinics and classes, The Modern Hospital, February, 1918.
Nutritional guidance, The Modern hospital, July, 1916.
A scale for grading nutrition. School and society, Jan. 22, 1916. pp. 123-4.

MENDEL, LAFAYETTE B.
Changes in the food supply and their relation to nutrition. Yale university press, 1916.
Nutrition and growth. Lippincott, 1915.

MILWAUKEE, WISCONSIN.
Annual report of department of school hygiene of the board of school directors, 1916. p. 16 (records of open window class).

MONROE, PAUL (EDITOR)
Cyclopedia of education. Articles on growth, nutrition, school lunches and feeding.

NEARING, SCOTT.
Financing the wage earner's family. Huebsch, 1913.

NEWMAN, SIR GEORGE.
Reports of chief medical officer, board of education, England, 1908 on—

NEW YORK CITY.
Department of education. Annual reports on special classes; anemic and tuberculous.

PARKER, W. GIBSON.
Infantile mortality and the health of survivors in elementary schools. Public health, April, 1913.

PHILBRICK, INEZ C.
Malnutrition and sociology. Medical record, Aug. 26, 1908.

RAPEER, LOUIS W.
School health administration, Teachers college, 1913.
Educational hygiene. Scribners, 1915. (Bibliography.)

ROACH, WALTER W.
A food clinic for the treatment of poorly nourished, underweight, anemic, retarded children at the Wood public school, Philadelphia. Teacher 17: 233-36. Sept., 1913.
The importance of proper nutrition for school children. Illustrated by the results of a food clinic at the Wood school, Philadelphia. School progress—4: 386-88, Nov., 1913.

ROPER, R. E.
Physical education in relation to school life. London, 1917.

ROSE, MARY SWARTZ.
Feeding the family. Macmillan, 1916.
The children's food. Emergency committee, Home economics association. New York City.

RUBNER, MAX.
Leitsätze betreffend die ernährungsverhaltnisse der volkschulkinder. Internationales archiv für schulgiene, Mai, 1910. pp. 357-364.

SCHLOSS, OSCAR M.
Helminthiasis in children. American journal of the medical sciences, May, 1910.

SCHMITT, CLARA.
An experiment in the feeding of undernourished school children. Educational bi-monthly, June, 1916. p. 379.

SEASHORE, CARL E.
A child welfare research station, plans and possibilities of a research station for the conservation and development of the normal child. Bulletin of the State University of Iowa, Jan. 15, 1916.

SHERMAN, HENRY C.
Chemistry of food and nutrition. Macmillan Co., 1911.

SHERMAN, H. C. AND GILLETT, L. H.
The adequacy and economy of some city dietaries. A. I. C. P., New York City, 1917.

SILL, E. MATHER.
A study of malnutrition in the school child. Journal American Medical Association, Chicago, 1909, vol. 52, 1981-1985. vol. 53, 712.
How may we better the condition of the growing child? Study of 210 malnourished New York East Side children under ten years of age, Medical record 81: 898-900, May 11, 1912.

SPARGO, JOHN.
The bitter cry of the children. New York, 1906.
STAFFORDSHIRE COUNTY COUNCIL.
Annual report of the school medical officer, 1916, pp. 37-42.
STREIGHTOFF, F. H.
The standard of living among industrial people of America. Houghton Mifflin Co., 1911.
STRUTHERS, LINA ROGERS.
The school nurse, chapter XI, Debilitated children. G. P. Putnam's Sons, 1917.
UNDERHILL, FRANK P.
Report on nutrition investigation, New York, 1907; Buffalo, 1908. (*In* Chapin. The standard of living, pp. 319-325.)
WEBB, SIDNEY AND BEATRICE.
The prevention of destitution, London, 1911.
WHITELEGGE, SIR ARTHUR AND NEWMAN, SIR GEORGE.
Hygiene and public health. London, 13th edition, 1917.
WILE, IRA S.
School lunches. Journal of home economics, II: 162-9.
Medical inspection and the nutrition of school children. Fourth international congress school hygiene, vol. V, pp. 266-279.
Malnutrition, a problem in medical inspection, New York medical journal. April 15, 1916. p. 729.
The cost of educating the underfed, School and society, December 30, 1916.
WILLIAMS, LEWIS.
The medical inspection of children under school age. Journal royal sanitary institute, 1912. p. 639.

II. GROWTH.

ARNOLD, FELIX.
Weights and school progress, Psychological clinic, April 15, 1916.
BALDWIN, BIRD T.
Physical growth and school progress. U. S. bureau of education bulletin. November 10, 1914. (Contains bibliography of experimental studies in physical growth—336 titles).
A measuring scale for physical growth and physiological age, Nat. society study ed. year book, 1916, part 1, pp. 11-22.
BEANN, C. HOMER.
Starvation and mental development, Phychological clinic 3: 78-85. May 15, 1909.

BOARDMAN, HELEN.
Psychological tests—bibliography, Bureau of educational experiment, 1917.

BOAS, FRANZ.
Changes in bodily form of descendants of immigrants. Immigration Commission, U. S. Senate, 1911.
Growth *in* Monroe's cyclopedia of education, vol. 3, pp. 187-190.
U. S. Bureau of education, report of commissioner, 1896-7, vol. 2, pp. 1541-99 and 1904, vol. 1, pp. 25-132.

BOWDITCH, H. P.
The growth of children, Massachusetts board of health, 8th and 10th annual reports, 1875 and 1879.
The relation between growth and disease. American medical association. Transactions, 1881, vol. 32, pp. 370-6.
"It seems probable that the actual determination of the normal rate of growth will not only throw light upon the nature of the disease to which childhood is subject, but will also guide us in the application of therapeutic measures."

BRYAN, E. B.
Nascent stages and their pedagogical significance. Pedagogical seminary, 7: 357-96 (1900).

BRITISH ASSOCIATION REPORTS.
1880. p. 126.

BURK, F.
Growth of children in height and weight, American journal of phychology, 9: 253-326.

DE BUSK, B. W.
Height, weight, vital capacity and retardation. Pedagogical seminary, March, 1913.

DUBOIS, E. F.
The metabolism of boys 12 and 13 years old compared with metabolism at other ages. Archives of internal medicine, June, 1916. p. 887.

GODDARD, H. H.
The height and weight of feeble minded children in American institutions. Journal of mental and nervous diseases, 39: 217-235. 1912.

GRADY, W. E.
Age and progress in New York City. Psychological clinic, Jan. 15, 1913.

GREENWOOD, ARTHUR.
Health and physique of school children. Ratan Tata Foundation. London, 1915.

HALL, G. S.
Growth in height and weight. *In* Adolescence, vol. 1, pp. 1-50.

HOLT, L. E.
Diseases of infancy and childhood. 1917.

KEY, AXEL.
Schulhygienische Untersuchungen, Hamburg, 1889.
"Liability to sickness decreases with increasing rate of growth and increases with decreasing rate of growth; therefore one may be taken as the measure of the other."

KING, IRVING.
Physical age and school standing. Psychological clinic, Jan. 15, 1914.

LEWIS, CHARLES B.
Adolescent physical types. Pedagogical seminary, September, 1916, pp. 295-324. (Contains bibliography on anatomic and physical types, 34 titles, work of Bryant, Goldthwaite, et al.)

REAVIS.
The relation between the physical and health conditions of children and their school progress. Elementary school journal. October, 1914.

ROBERTSON, T. BRAILSFORD.
Studies on the growth of man. American journal of physiology, 1915, vol. 37: 1; 1916, vol. 41: 535 and 547.

SCHUYTEN, M. C.
The co-efficient of nutrition in Antwerp school children. Fourth international congress on school hygiene, vol. IV, pp. 106-108, Buffalo, 1913.

WITMER, LIGHTNER.
Nutrition and growth in the special class for backward children. Psychological clinic press, 1912.

PUBLICATIONS RECEIVED

Through lack of space, we are forced to omit all reviews this quarter. They will be included in our September issue. Publishers will kindly take notice.

The American Journal of School Hygiene

VOL. II SEPTEMBER, 1918 No. 3

PUBLISHED QUARTERLY, IN MARCH, JUNE, SEPTEMBER AND DECEMBER

Edited by Lawrence Augustus Averill

with the assistance of the following contributing editors:
Professor William H. Burnham, Clark University
Professor Fletcher B. Dresslar, George Peabody College for Teachers
Professor Lewis M. Terman, Leland Stanford Junior University
Dean Louis W. Rapeer, University of Porto Rico
Dr. C. Ward Crampton, Department of Education, New York City

WAR AND THE SCHOOL

BY PARINIO CEPPELLINI

(Translated from the Italian by the Editor of this Journal)

NOTE: In "War and the School," Dr. Ceppellini has made brief summary comment upon the present educational situation in Italy resultant upon the war. Thus far, the Editor believes, we have had no statement in English on this topic. The publishing of this article, it is to be hoped, will serve in a small way to familiarize us in this country with some of the problems which our Italian allies face in their work of educational reconstruction. The original article appeared in the May, 1918, number of "L'Igiene della Scuola," under the title "Guerra E Scuola."—Ed.

It was obvious that the public school should be the first of all our institutions to suffer in consequence of the war, yet that does not make less disheartening the memory of the work and sacrifice which have been bestowed upon it in recent years. The present circumstances to which it has been reduced, however, were not to be unforeseen. The all-absorbing war has assumed for us such gigantic proportions that in order to ensure its prosecution to a successful issue we and our valiant allies have been compelled to absorb in it every resource and every energy of the nation. Indeed the war is so basically and fundamentally related to every other economic and social problem that it has taken precedence in our minds and hearts over every other national necessity. Like a torrential whirlwind it has overturned our manner of living, our habits, our sense of values. In the storm and stress of the times we have been obliged to focalize all our thinking—and even to condition our very instincts—upon the crises of the hour. The war has not only required of us new tasks and new responsibilities; it has obligated us to sacrifice those things which before we should not have conceived it to be possible to do without. Science, industry, profession—in short, every activity of life has been given new orientation.

But the tornado is spending itself? Please Heaven! None the less, since it has wrought such widespread destruction and devastation, it is for us rather to size up the work which lies before us than to passively await the end. Our task is to prepare for the morrow. Every wise provision and every beneficent act of the Government looking toward the colossal tasks of repair and reconstruction which confront us must have the completest and most eager support of every citizen if aught save mediocre success is to attend. Lovers and administrators of the public school are already raising their voices in warning lest we make the grievous error of supposing that public education after the war will spontaneously spring up out of the social ruins and move forward under its own impulsion. Rather, there is grave danger that the results of so many years of labor may be entirely wiped out—at least so far as education is concerned—and consequently it is essential that wise and prudent action be taken at once.

A survey of our public school situation at the present time would indicate varying degrees of neglect and privation throughout the country. In general it appears that those schools located in regions of closest proximity to the actual battle zone are in much the worst condition. In the more calm and remote districts the degree of neglect and abandon is doubtless lesser, although in no case have our schools remained scathless from the far reaching effects of war. In larger city and small country district alike, the school building has almost invariably been transformed into a hospital, or the headquarters of an officer's staff, or barracks for the soldiers. In whatever district the war has made itself felt, be it by the thunder of the cannon or by other gruesome tokens of its reality, the school has been compelled, in order to exist at all, to fit itself into the exigencies of the time, place and circumstance. Thus it no longer possesses that homogeneity and unity whereby we were formerly enabled to maintain for all of our children a definite and universal educational pathway; it has been disorganized and disjointed, and pupils have had to be quartered in every conceivable sort of nondescript building, with little regard for hygienic principle or sanitary law. It has reverted to the wretchedly primitive estate of the days of its smaller fortune, and upon the field of battle it has lost not a few of those who have been its strongest champions. Today the public school in Italy is like a pubescent organism into which the inroads of a consuming malady have made their way. And lest the resulting weakness become chronic we must take immediate measures to check its progress and eradicate its causation. My

military duties have enabled me to study with some thoroughness the condition of the schools even in such regions as Friuli, Veneto, parts of Lombardy and Emilia and Romagna where every effort had always been made to make them efficient and modern institutions. Even here, however, while the greater part of the *Comuni* I found to be maintaining schools, they were housed in buildings poorly equipped, unhygienic and often remote from the school population centers. It should be said, however, that in some country districts were found excellent school houses.

Both in the urban centers and to a less degree in the country, the expenditure of money for educational purposes before the war had begun to show an encouraging and substantial increase. This more liberal educational policy was largely the result of freeing the schools from political control and from the oversight of the religious and charitable congregations. But where are we now? The war has interfered seriously with school finances exerywhere, and herein lies another task which will require much labor and solicitude. Financial aid has been diverted from it and the school thus loses its essential sustenance. Forsaken by the scholars, forgotten by the citizens and poorly supported by the state, the Italian public school is in grave danger of becoming destitute indeed.

And yet never before was there greater need of maintaining public education at a high level. Our social and industrial demands are calling mothers from the home and installing them in the camp, the factory and the public works. It is a fact that woman has amply demonstrated her capacity in the past few years to render public service of the first order, and increasingly in the future as the paucity of our men becomes more and more serious we should find ourselves forced to make a general call for her help and co-operation in things outside the home. When this time comes, how shall we look for moral progress in the race if we abandon her children to the streets, to idleness and to vice, after denying them the care and training which the worker would otherwise be able to give them? Eternal vigilance and foresight must be ours. If human beneficence and effort have been led into a thousand other channels in order to minister to the thousands of other needs which the war has entailed, it is the more incumbent upon us to gird up our loins and redirect a portion of these blessings to the public schools.

Even the briefest delay is perilous. No experience so much as that of these unhappy years of war has demonstrated to us the

complete efficacy of the public school in creating and nurturing the real soul of a nation. Witness the Germans! They have not failed to make good use of their schools as a means of inculcating into the youth a sense of blind obedience and vigorous discipline. It is at the school bench that Germany has taught her boys to chant *"Deutschland, Deutschland über alles!"* And it is in the corridors and upon the exercising place that they have acquired the military step, a spirit of absolute and o'er-weening confidence, and that habit of blind, unquestioning obedience to superiors which so characterizes them. God forbid that the school of tomorrow, either in Italy or among her allies—or among her enemies—is to be the training ground for future war! But the school is to the life of the nation what the father is to the child. If the father be alcoholic, or vicious in his influence and example, what wonder that his issue be in like manner delinquent! It is incumbent upon society to surround every child with the essential environment for progress, and this environment is represented in highest measure by our facilities and aims in public education.

And we who devote ourselves to the great work of reconstruction in education must appreciate that days filled full with labor and thought lie ahead of us. Indeed, the great principles and ideals of education are yet far from being realized or even in all cases, formulated. It would be absurd to presume that even in those localities which are leaders in educational practice the aims of education have been completely established or its methods stated. In matters of educational hygiene notably we are still woefully lax. Of such all-important affairs of educational moment as the correlation between physical condition and mental ability in the school child; satisfactory programs of physical education; the children's diseases, so-called, and their bearings upon the work of the school; the school physician, his duties and responsibilities—of these we still know but little. Largely throughout our country the child's health is dependent entirely upon the intelligence and interest of the teachers. As yet the duly qualified medical inspector by no means enjoys the authority and respect which he merits. In not a few places even, he has no official recognition and is regarded by the teachers themselves as an intruder who interferes with their routine work. Nor is this attitude on their part always unjustifiable, for it is a fact that the school physicians are often possessed of little skill and know or care little about the public schools. All this must be changed, and changed quickly. An attitude of confidence must be created

within public opinion; opposition, wherever it is met with, must be dispelled. Full cooperation between teacher and medical inspector is as essential as between teacher and parent. The whole matter of school health work is so important that when the problems of the school are once more taken up, it must be looked upon as the most important feature of public education and provided for accordingly.

But the needs and exigencies of war have gone further still in weakening and handicapping the work of education. It has made possible and even encouraged the desertion of pupils from their work. Here is another unfortunate condition to be righted at the earliest possible moment. It will not do to allow the boy to accustom himself to the idleness and the lack of restraint and discipline which exist outside the influence of the school. In these stirring times it is not difficult to see why the boy should prefer to his desk the freedom of the street and square; or to his master, the comradeship of companions of his own age and mind; or to study, play. All his instincts and inexperience impel him insuperably toward the latter. It appears that this desertion is especially common among the higher grades in those schools more adjacent to the war zone. This again is but a natural condition, inasmuch as the imminent war has filled every family and every mind with such preoccupation that the school wherever it does exist has been reduced to a few perfunctory lessons given amid physical surroundings which are unattractive in the extreme.

Then too, there is the grim necessity which has so frequently operated to force the children to give up their school work. This condition cannot be said to be limited to any particular region; from the very nature of the need, it is well-nigh universal throughout Italy. In the homes there are left only the women, with their younger children and the aged. Every able-bodied male has been enrolled in the army. Who is left to sustain agriculture? Who to protect essential industry? The answer is unescapable. There is none save the woman and the boy. In the country districts are thousands of young laborers who have undeveloped or retarded physical organisms. The mother, knowing full well her country's need and bending her will to the call of the hour is sacrificing her sons willingly upon the altar of toil and self-denial.

Even the law of June 4, 1911, by which 240 millions of *lire* were voted to be apportioned for schools and their equipment at the rate of 20 millions per year, has not been fruitful of the ex-

pected results. The needs of the war have paralyzed all educational effort, and the provisions of even the most liberal and beneficent laws have undergone a fatal arrest in the emergency. Notwithstanding the enforced abortion of our school programs, however, we must not lose faith in the certainty of the future revival of the entire system. Greater strengthening, greater unification, greater integration are the promise of the future, toward which we must bend our every energy. In this conviction, we can acquiesce with enthusiasm in the recent statement of the Minister of Public Instruction to the effect that "the opportunity is to be at once seized of restoring the elementary schools in the *Comuni* of the regions adjacent to the war zone, lest their socializing and liberalizing influence in such a vast territory be partially or wholly nullified."

Let this be the first stone of the great educational edifice to be reconstructed in the near future.

PRELIMINARY DRAFT OF A BILL

To provide for the promotion of physical education; to provide for co-operation with the states in the preparation and payment of directors, supervisors, and teachers of physical education; and to appropriate money and regulate its expenditure.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled that there is hereby annually appropriated, out of any money in the treasury not otherwise appropriated, the sums provided in sections three and four of this Act, to be paid to the several states and the territories of Alaska, Porto Rico, Hawaii and the District of Columbia for the purpose of co-operating with the States and territories in the preparation and payment of directors, supervisors and teachers of physical education; and the sums provided for in sections six and eight for the use respectively of the Bureau of Education of the Department of the Interior and the Bureau of the Public Health Service of the Treasury Department for the administration and execution of this Act which sums shall be expended as hereinafter provided.

SEC. 2. The purpose and aim of physical education in the meaning of this Act shall be: more fully and thoroughly to prepare the boys and girls of the nation for the duties and responsibilities of citizenship through the development of bodily vigor and endurance, muscular strength and skill, bodily and mental poise and such desirable moral and social qualities as courage, self-control, self-subordination and obedience to authority, co-operation under leadership, and disciplined initiative; through adequate physical examination and the correction of postural and other remediable defects; through promotion of hygienic school and home life; and through scientific sanitation of school buildings, playgrounds and athletic fields and the equipment thereof.

SEC. 3. That for the purpose of co-operating with the States and territories in the preparation of directors, supervisors and teachers of physical education through state normal schools and other state institutions in which teachers are prepared there is hereby appropriated for the use of the States and territories:

For the fiscal year ending June thirtieth, nineteen hundred and nineteen, the sum of $1,000,000;

For the fiscal year ending June thirtieth, nineteen hundred and twenty, the sum of $1,500,000;

For the fiscal year ending June thirtieth, nineteen hundred and twenty-one, and annually thereafter the sum of $2,000,000.

SEC. 4. That for the purpose of co-operating with the States and territories in paying the salaries of directors, supervisors and teachers of physical education, there is hereby appropriated for the use of the States:—

For the fiscal year ending June thirtieth, nineteen hundred and nineteen, the sum of $10,000,000;

For the fiscal year ending June thirtieth, nineteen hundred and twenty, the sum of $13,000,000;

For the fiscal year ending June thirtieth, nineteen hundred and twenty-one, the sum of $16,000,000;

For the fiscal year ending June thirtieth, nineteen hundred and twenty-two, the sum of $18,000,000;

For the fiscal year ending June thirtieth, nineteen hundred and twenty-three and annually thereafter, the sum of $20,000,000.

For the year ending June thirtieth, nineteen hundred and nineteen, the sums provided for in sections three and four shall be allotted to the States and territories and the District of Columbia in the proportion which their population between the ages of 6 and 18 years of age bears to the total population of the United States between 6 and 18 years of age inclusive, including the territories of Alaska, Porto Rico and Hawaii and the District of Columbia, according to the United States census of 1910; *thereafter* said sums shall be allotted to the States and territories and the District of Columbia in the proportion which their population between the ages of six and eighteen year inclusive, bears to the total population of the United States including the territories of Alaska, Porto Rico, Hawaii and the District of Columbia between the ages of six and eighteen years inclusive, according to a school census of the next preceding biennium taken by the State Departments of Education in conformity with regulations prescribed by the Bureau of Education with the advice of the Bureau of the Census of the Department of Commerce.

SEC. 5. That the Bureau of Education of the Department of the Interior shall be responsible for the administration of this act. The Commissioner of Education shall from time to time make and publish uniform rules and regulations for carrying out the pro-

visions of this Act; and shall make or cause to be made studies, demonstrations, investigations and reports with particular reference to their use in aiding the States in the organization and conduct of physical education in elementary, secondary and normal schools.

SEC. 6. That there is hereby appropriated to the Bureau of Education of the Department of the Interior the sum of three hundred thousand dollars annually, to be available from and after the passage of this Act for the purpose of paying salaries in the District of Columbia and elsewhere and of making studies, demonstrations, investigations and reports; and of paying all incidental expenses, including traveling expenses, printing, office rent in the District of Columbia and elsewhere and such other expenses as the Commissioner of Education may deem necessary to the execution and administration of this Act.

SEC. 7. For the purpose of co-operating with the Bureau of Education of the Department of the Interior in the execution and administration of this Act, the Bureau of the Public Health Service of the Treasury Department shall make studies, demonstrations, investigations and reports concerning health examination and health supervision of school children and schools including sanitary requirements of school buildings, grounds, athletic fields and equipment thereof. All regulations relating to health examination and health supervision of school children and schools including sanitary requirements of school buildings, grounds, athletic fields and the equipment thereof shall be approved jointly by the Surgeon General of the Public Health Service and the Commissioner of Education before they are prescribed by the Commissioner of Education.

SEC. 8. That there is hereby appropriated to the Bureau of the Public Health Service of the Treasury Department the sum of one hundred thousand dollars annually to be available from and after the passage of this Act for the purpose of paying salaries and of making studies, demonstrations, investigations and reports; and of paying all incidental expenses, including traveling expenses, printing, office rent and such other expenses as the Surgeon General of the United States Public Health Service may deem necessary to the proper performance of the duties specified in Sec. 7 of this Act.

SEC. 9. That in order to secure the benefits of the appropriations provided for in Sections 3 and 4 of this Act any State or Territory shall, through the legislative authority thereof, accept

the provisions of this Act and designate its State Department of Education with all necessary power to co-operate as herein provided with the Bureau of Education in the administration of the provisions of this Act; provided that no State shall receive any part of the fund appropriated in Section 4 of this Act for the payment of directors, supervisors, and teachers of physical education until said State shall have established a satisfactory system for the preparation of directors, supervisors, and teachers of physical education, under the direction and supervision of the State Department of Education and approved by the Commissioner of Education; provided further that the legislature, in the acceptance of the provisions of this act, shall designate and appoint its State treasurer as custodian of said funds, who shall receive and provide for the proper custody and disbursement of all moneys paid to the State from said appropriations, said disbursements to be made from warrants duly drawn by the said State Department of Education; and provided further that the legislature, in the acceptance of the provisions of this Act, shall provide for a biennial census of all children in the State between the ages of six and eighteen years inclusive to be taken by the State Department of Education in conformity with regulations prescribed by the Commissioner of Education.

In any State the legislature of which does not meet within six months after the passage of this Act, the Governor of that State, so far as he is authorized to do so, may accept the provisions of this Act and designate the State Department of Education as aforesaid to act in co-operation with the Bureau of Education, for the purposes of this Act until the legislature of such State meets in due course and has been in session sixty days.

SEC. 10. That in order for any State to secure the benefits of the appropriations for any purpose specified in this Act, the State Department of Education, in conformity with the provisions of this Act and in conformity with such rules and reglations as shall have been announced by the Commissioner of Education, shall prepare plans showing how and for what objects it is proposed to use said appropriations. Such plans shall be submitted to the Bureau of Education by the State Department of Education and if the Commissioner of Education finds such plans to be in conformity with the provisions of this Act and with such rules and regulations as have been announced, said plans shall be approved and allotments shall be made; provided that such plans shall provide that for each dollar of the Federal money expended for any

purpose under the provisions of this Act, the State or local authority or both shall expend not less than an equal amount and that no money shall be paid for any purpose specified in this Act, in any year, to any State until at least an equal amount has been provided by the State or by the local authority or by both for such purpose; provided further that no portion of any moneys appropriated under this act for the benefit of the States shall be applied, directly or indirectly, to the purchase, erection, rental, preservation or repair of any building or buildings, or equipment, or for the purchase or rental of lands; provided further that no portion of such moneys shall be used by any State, county, district or local authority for the support of any religious or privately endowed, owned, or conducted school or college, but only for the support of such schools as are owned, controlled and conducted by said State, county, district or local authority as may be provided for under the laws governing and regulating the public schools of said State.

SEC. 11. That in order for any State to receive the benefits of the appropriations provided in this Act for the payment of directors, supervisors, and teachers of physical education, the State Department of Education in its plan of organization of physical education shall provide that such physical education is planned to meet the needs of children from 6 to 18 years of age inclusive; that the State, county, district or local authority or both shall provide the playgrounds, athletic fields, gymnasiums and equipment necessary for a well-rounded course of physical education; provided that the moneys appropriated for the purpose of paying the salaries of teachers, supervisors and directors of physical education shall be used exclusively for the payment of such salaries.

SEC. 12. That the Commissioner of Education shall annually ascertain whether the several States are using or are prepared to use the money received by them in accordance with the provisions of this Act. On or before the first day of January of each year the Commissioner of Education shall certify to the Secretary of the Treasury each State which has accepted the provisions of this Act and complied therewith, certifying the amount which each State is entitled to receive under the provisions of this Act. Upon such certification the Secretary of the Treasury shall pay quarterly to the custodian for physical education of each State the moneys to which it is entitled under the provisions of this Act. The moneys so received by the custodian for physical education

for any State shall be paid out on the requisition of the State Department of Education, to be used only for purposes for which appropriated and upon the approval of said State Department. Whenever any portion of the fund allotted to any State in any year has not been expended for the purposes provided for in this Act, such portion of the fund shall revert to the Treasury of the United States.

The Commissioner of Education may withhold the allotment of money to any State whenever it shall be determined that such moneys are not being expended for the purposes and under the provisions of this Act. If any portions of moneys received by the custodian for physical education of any State under this Act for any purpose named in this Act shall by any act or contingency be diminished or lost or misapplied, it shall be replaced by such State, and until so replaced no subsequent appropriation for such physical education shall be paid to such State.

SEC. 13. That each State shall not later than September 1 of each year make a report to the Commissioner of Education, showing in detail the work done in the State during the year ending June thirtieth next preceding in carrying out the provisions and purposes of this Act and the receipt and expenditure of money in connection with such work. Said reports shall be in such form as the Commissioner of Education may prescribe. The Commissioner of Education may, in his discretion, discontinue immediately any allotment which may have been made to any State that fails to make said report in the form and within the time prescribed.

SEC. 14. That the Commissioner of Education shall make an annual report to Congress on or before December first on the administration of this Act and shall include in such report a summary of the reports made by the State Department of Education on the Administration of this Act by each State and expenditure of the money allotted to each State.

SEC. 15. For the purposes of this Act, the word "State" wherever used in Sections 9 to 14, inclusive, shall be construed to include "State, Territory, or District of Columbia;" and that the term "State Department of Education" wherever used in Section 9 to 14, inclusive, shall be construed to mean the educational authority administering the educational laws of any State or Territory or the District of Columbia.

—Draft of the federal bill prepared by the *National Committee on Physical Education.*

SCHOOL HYGIENE AND TRAINING FOR CITIZENSHIP

A SUGGESTED COURSE OF STUDY IN HYGIENE FOR THE PUBLIC SCHOOLS

BY LAWRENCE AUGUSTUS AVERILL

Editor of the American Journal of School Hygiene

GOOD CITIZENSHIP THE ULTIMATE GOAL OF EDUCATION. The aims of education have been variously defined by different writers and theorists of the past and present. The best working definition of education appears, however, to be training for social adjustment, and from this viewpoint the highest test of the public school is to be found in the kind of citizens it turns out. Man's real value is social, not individual; community, not family. Democracy means more than a job and a home; it means also citizenship and communal living. It implies co-operation and interdependence; it means freedom under the law; it means altruism and forbearance. Good citizenship in a democracy therefore is positive and progressive.

The ideal of democracy is a somewhat complex one in which good government, wise leadership, broad institutions, productive activity and a refined national consciousness each finds a place. If our country had yet attained or even approximated this ideal in every respect, the modern agitation for better citizenship would not have been called forth. But our country is the greatest and most gigantic experiment in democracy and true citizenship that the world has ever seen, and it would be inconceivable that an experiment of such magnitude could be checked up in the relatively brief period of time during which the nation has been in existence.

Then too, the experiment is complicated utterly without precedent by the infusion into our body politic of a most cosmopolitan element from other lands; by the consequent admission into our public schools of several hundreds of thousands of children possessed of different ideals, different traditions and different inheritance; and finally now by a forsaking of our neutrality and a determined entry into a world war of colossal proportions and incalculable social effects.

THE HOPE OF DEMOCRACY IS VESTED UNEQUIVOCALLY IN THE PUBLIC SCHOOL. Our ultimate hope for the safety and dominance of democracy lies now as never before in the public schools. Education for citizenship, for true Americanism, becomes the cry of the hour. If our land is the great melting-pot for alien races our schools must furnish the fuel and energy under the crucible. If there is one institution, one activity, that cannot continue as usual under the stress of the times, that institution is the public school. *Not as usual but ten times more than usual* must be our gauge. Not the provincialized three R's, but the socialized three R's. Not the unrelated school but the community school. Not the precept of individualism but of *civism.*

Side by side, therefore, with the orthodox curricular subjects, and as closely as possible correlated with and related to them, the teaching of the duties and responsibilities of citizenship in our public schools becomes a matter of supreme importance if the American type of tomorrow is to be a fitting and honorable successor to the American type of yore. The recent establishment within the United States Bureau of Education of a department of Civic Education, and the initiation on the part of some of our leading states of a training-for-citizenship program are the logical consequents of the pressing need of such training of a nation-wide scope.

WHAT THE TERM CIVICS REALLY MEANS. The term *civics* is a very broad and inclusive one. As ordinarily interpreted in the past it has too often been limited to a study of the problems of local and state government and the rights of citizens under the law. In the present emergency, however, the term must be given its widest interpretation, and be made to include not only a study of man's *rights,* but of man's *duties* as well. Thus, the fact that a man is cognizant of the law which prohibits spitting upon the sidewalks or in public places does not necessarily imply that he is a good citizen; but it is a token of eminently good citizenship if that man so appreciates his duty toward his neighbor and toward society as to refrain from spitting overtly upon the walk even when no one chances to be looking. Similarly, it is not necessarily an earnest of good citizenship if a man is aware of the right of suffrage guaranteed him under the law; but it is an evidence of the finest sort of citizenship if that man regards this privilege in the light of a social duty, and never willingly misses an opportunity of going to the polls in the interests of the common weal.

The term *civics,* then, implies, as we stated above, not only forbearance before the law, but, more positively, it implies a sub-

jective and sympathetic appreciation of the whole range of man's social relationships with his fellow man. Obedience to law is liberty—and liberty merely; appreciation of law is citizenship. The former means merely freedom from restraint—passivity; the latter means co-operative citizenship—progress.

THE RELATIONSHIP OF HYGIENE TO CIVICS AND CITIZENSHIP. One of the great means of attaining true co-operative citizenship is through the proper appreciation of the fundamental principles of hygiene—personal and community. It is the aim of this paper to enumerate these principles—insofar at least as they can be readily incorporated into the work of the public schools.

The term *hygiene* means *health*. Health is both personal and community, and as such may well be looked upon as the starting-point of good citizenship. Personal hygiene and community hygiene are mutually supplementary; indeed, the one cannot exist in a neighborhood without the other. If we could imagine a Utopia where every citizen practiced all the laws of personal health, obviously we should expect to find there the science of community hygiene and sanitation very highly developed. Conversely, a Utopia in which community hygiene was ideal would imply a high degree of personal hygiene among the citizenry.

PERSONAL HYGIENE AND TRAINING IN CITIZENSHIP. The chronic condition of a person's health is often a fair index of his value as a citizen. Good health implies good personal habits. Habits are formed only in youth, and chiefly before the middle teens. Everyone knows how difficult it is to break old habits that have fastened upon one in childhood. It follows, therefore, that it becomes one of the supreme duties of the public school—inasmuch as long testing has demonstrated the home to be supine in such matters—to foster correct habits of health in the children. Nearly every moment passed in the primary grades is a psychological one for fixing habits, and if the school neglects the opportunity thus offered it, it will be hindering the advancement of the cause of good citizenship in a very vital way.

COMMUNITY HYGIENE AND TRAINING IN CITIZENSHIP. Neighborhood or community hygiene and sanitation offer one of the finest sources for field work in good citizenship for older children. Community health is a phase of hygiene which has received scant attention in the past, and none thus far in the schools. It is apparent, however, that no one can be a thoroughly good citizen and be at the same time ignorant of some of the great principles underlying the wider aspects of hygiene and sanitation. Here is a field where it is easy to demonstrate to school children in how

far we are all our brothers' keepers. The great lesson of co-operation may be learned here in such a direct way that it can never be forgotten.

HYGIENE TEACHING IN THE PAST. Physiology has long been a subject of study required to be taught in the elementary school, but teachers have almost universally pronounced it a failure as it has ordinarily been taught. And failure it has too often been, partly because the teacher could not get away from the anatomical viewpoint which the text-books were guilty of exploiting; partly because she herself had had little or no training in the subject; and partly because she did not understand the psychological method of approach. Instruction in physiology has become, therefore, a sort of formal drill in the principles of human anatomy, which is of doubtful value to school children. In one schoolroom recently visited—in which the thermometer read 76 F.,—a teacher was found to be expounding from a textbook the intricacies of the lymphatic circulation to a class of boys and girls 12 years of age!

No textbook in physiology ought ever to be found in an elementary school, nor should the word *physiology* ever be mentioned in anything more than an incidental manner by the teacher. We must shift our emphasis from *structure,* and perhaps even *function,* to *hygiene, health.* It matters little whether a 13-year-old boy knows the scapula from the clavicle, provided he has been trained to stand and sit erect, nor is it vital whether a 10-year-old can describe the structure of his teeth, provided he has formed the habit of keeping them clean. *Any instruction beyond the hygiene of an organ—plus enough anatomy to render this knowledge intelligible—has no place in the public schools.*

WHAT FORMAL DRILL IN PHYSIOLOGY MEANT TO EIGHTH GRADE NEBRASKA SCHOOL CHILDREN. The following are some typical answers taken in 1916 from the pupils' examination papers in one of the best educational counties in Nebraska.* The inference is obvious.

"A common disinfectant is small-pox."
"Mastication is what is going on."
"Epidermis is a certain kind of medicine."
"The diaphragm is another name for backbone."
"The bones are made up of hard mucous membrane."
"Pericardium is something that will put you to sleep."
"Respiration means all the different juices in the body."
"The diaphragm is very delicate and located in the head."

*Cf: AM. J. SCH. HYG., Vol. I, No. 5.

"Fumigation is when the air is shut off and death may come."

"The Eustachian tube is a tube running all over the body."

"The nervous system is a kind of tube where the blood vessels are in."

"The process of digestion causes headaches and much impure blood. Fried potatoes often cause digestion."

"A disinfectant is anything you catch by going where they are. Measles and chickenpox are disinfectants. When you have them you should stay in the house and keep warm and try not to give them to others. Pimples on the face are not disinfectants, but some kinds are."

ALCOHOL AND TOBACCO. But little better results, unfortunately, have been achieved in instruction concerning the ill effects of alcohol and tobacco, which is required by statute in most states. It is little use to caution a boy that if he ever uses tobacco in any form he will be a prey to indigestion, chronic dyspepsia and the dread "tobacco heart!" The boy's values are present, not future; his life is measurable only in terms of the imminent. Nor is it the shrewdest sort of pedagogy which paints lurid pictures of the effects of alcohol upon the tissues and assures young people that drunkards have highly inflamed mucous membranes all along the alimentary canal! The mysteries of the unseen interior of his body are as unattractive to the practical child as they are invisible.

THE END OF HYGIENE TRAINING IS NOT ANATOMICAL KNOWLEDGE BUT DEPENDABLE HEALTH HABITS. The far too common practice of attempting to teach young children under 10 or 12 the physiological effects upon the system of stimulants and narcotics, or facts concerning the structure of the body tissues, or the functions of organs, or the circulation of the blood, or the secretions of the glands, etc., is a waste of time and effort. Yet these are but a few of the topics mentioned in most courses of study for children in the lower grades, and in part often required by the laws of the states. The mind of the child at this age cannot grasp material of this sort. Information must be concrete, definite and simple of comprehension. The point to be emphasized in the teaching of elementary hygiene is not the *why* in health but the *how* in health. It is a matter of little importance whether the child understands why his nails and teeth and skin should be kept clean; the important thing is that he be aided in the formation of the correct habits of keeping them clean. Similarly, explanations and reasons which depend upon a remote future condition of health or disease are of little consequence to childhood.

MOTIVATION IN HYGIENE TEACHING. This of course does not mean that there ought not to be strong motives to stimulate and encourage the child to form correct habits. On the contrary we must look to our knowledge of child nature to supply us with motives, and cease depending upon what would presumably be sufficient motivation to adults. Such motives are to be found in the child's natural interests and instincts. (Pride, emulation, imitation, class and group or individual rivalry, activity, approbation, ambition, sportsmanship, etc., etc.) For example, a group of children might far more easily be led to strive for better posture in sitting or standing through an appeal to rivalry or pride than through a discussion of the anatomy of the vertebra. Again, the same instincts, if properly appealed to, would more quickly and positively lead a child to keep his nails clean than would a peroration upon the bacteria that might be harbored under a dirty nail. The writer once knew a boy who experienced a sort of diabolical joy in the knowledge that millions of tiny organisms were growing at the ends of his very fingers! Was it his fault, or his teacher's, that he not only possessed but secretly took great delight in dirty nails?

THE PLACE OF THE TEXTBOOK. As we said above, there is no place for the orthodox *physiology* in the grades. Beginning with the third or fourth school year, however, a great deal of supplementary reading may very profitably be introduced. There are already upon the market several series of hygiene readers which meet this need admirably. The Gulick Hygiene Series (Ginn and Co.) and the O'Shea and Kellogg Health Series of Physiology and Hygiene (Macmillan) are but two of many series now obtainable. Briefly, the characteristics of a good reader for the grades may be summed up as follows:—

(1) Only sufficient physiology and anatomy to render the chief facts of hygiene reasonably comprehensible.

(2) Emphasis upon health rather than upon disease.

(3) A simple and interesting diction.

(4) The psychological method of approach.

(5) Copious and appealing illustrations.

(6) Subject matter very concrete and closely related to the everyday life and experiences of the child.

Whatever its good points, however, the supplementary reader cannot of course be relied upon to furnish the major portion of the material for any grade. At best it should be merely a supplement to the course of study followed. It is needless to add that the material read should be studied intensively and be thoroughly

worked over in the classroom. The capable teacher will strive constantly also to make possible direct applications of the principles learned in the life of the children from day to day, in order that the knowledge may go over immediately into action—otherwise it will be likely to be of little permanent value.

A SUGGESTED COURSE OF STUDY IN HYGIENE. Following is a brief topical outline of such a course of study in hygiene as should be worked out to take the place of the older course in *physiology*, or *hygienic physiology*, as it has been more recently styled, ordinarily followed in the public schools. It is beside the purpose of this bulletin to present the details of the course, the aim being merely to enumerate the principal topics and relate them psychologically to the interests and age of the child.

Grades 1 and 2. *Health hygiene.*
Grades 3 and 4. *Habit hygiene.*
Grades 5 and 6. *Home and school hygiene.*
Grades 7 and 8. *Community hygiene.*

HEALTH HYGIENE for Grades 1 and 2.

Aims. There is no formal teaching of hygiene in the first two grades. The aim of the work in these years should be to insure that every child shall form those habits of personal cleanliness that are fundamental to neatness and happiness. Dr. Hoag speaks of this period of life as a time when a child's habits ought to be reduced as far as possible to an automatic level.

The following personal habits should have become so fixed by the end of the second grade as to give evidence of reasonable permanency:—

(1) Clean hands, face, ears and skin.
(2) Nails trimmed and in good condition.
(3) Scalp clean and hair brushed.
(4) Teeth brushed and mouth in good condition.
(5) Wearing neat, clean clothing and carrying a clean handkerchief.

Method. The only method required in these grades is a careful morning inspection conducted by the teacher, or by exemplary pupils under her direction. Occasional health stories are always valuable if appealingly told.

Motive. Class, room, row or individual rivalry; pride; approbation, etc., etc.

Time. A minimum of 15 minutes a week.

HABIT HYGIENE for Grades 3 and 4.

Aims. The end of hygiene teaching in these grades is the same as in Grades 1 and 2, but with a scope so widened as to include

the proper reactions to all the major health-sickness situations in the environment of the child.

Following is a list of suggested habits upon which more or less inclusively the attention of third and fourth grade pupils ought to be focused:—

(1) Proper food habits.
  (a) Good and poor foods.
  (b) Tea and coffee; tobacco and alcohol.
  (c) Balanced diet.
  (d) Mastication.

(2) Proper fresh air habits.
  (a) Schoolroom ventilation.
  (b) Foul air in street-cars, theatres, stores, etc.
  (c) Breathing habits.
  (d) Outdoor play and sports.
  (e) Sleeping-room ventilation.

(3) Proper temperature habits.
  (a) Overheated rooms.
  (b) Clothing for summer and winter.
  (c) Colds and why we have them.
  (d) Thermometers and barometers.

(4) Proper posture habits.
  (a) Sitting; standing; working; playing.

(5) Proper exercise habits.
  (a) Exercise and health.
  (b) Exercise and happiness.
  (c) Ideal forms of exercise, such as swimming, rowing, coasting, etc.

(6) Proper habits of cleanliness.
  (a) Bathing—warm and cold.
  (b) Clean hands and faces.
  (c) Hands away from nostrils.
  (d) Clean clothing.

Methods. Story-telling, supplementary reading, simple experimentation, occasional inspection; observation.

Motive. Class, row, group or individual rivalry; pride; approbation; curiosity; activity; the soldier interest.

Time. A minimum of 25 minutes a week.

HOME AND SCHOOL HYGIENE for Grades 5 and 6.

Aims. The purpose of the hygiene work in Grades 5 and 6 should be to give the children a wide range of information in matters of every day import to health and efficiency. Among the

topics for study and investigation should be included the following:—

(1) The water supply.
  (a) Sources for school, home and city.
  (b) The common drinking cup; bubblers and fountains.
(2) Milk.
  (a) Importance of keeping milk clean and cool.
  (b) Milk for the baby.
  (c) Milk as a food.
  (d) Clean milkmen and safe sources of production.
(3) Selection of food in stores.
  (a) Cold storage of foods: use and abuse.
  (b) Common adulterations and how to detect them.
  (c) Substitutes and equivalents.
(4) Refrigeration and care of foods in the home.
  (a) Home-made refrigerators, coolers, milk shelters, window boxes, etc.
  (b) Cleanliness of all food containers.
(5) Garbage and wastes.
  (a) Garbage buckets and scavenger departments.
  (b) Disposal of waste papers and rubbish in the interests of fire prevention.
(6) Sweeping and dusting.
  (a) Hygienic versus non-hygienic methods.
  (b) Floor oils; dust-absorbers; oil dusters and mops; vacuum sweepers; etc.
(7) Flies, mosquitoes and other disease-carrying insects.
  (a) Life-history of the fly and mosquito.
  (b) Means of extermination.
(8) Clean homes, clean yards and clean schools.
(9) Infectious and contagious diseases.
  (a) The common children's diseases. (Mumps, measles, colds, etc., etc.) Modes of infection.
  (b) How diseases are ordinarily spread.
  (c) Vaccination, and other safeguards and preventatives.
  (d) How to escape "colds" and throat affections during the cold winter months.
(10) Pencils, towels, combs, handkerchiefs, etc.
  (a) Interchanging of books, pencils, etc.; common use of towels; "swapping" gum, etc.

Method. The children in grades 5 and 6 are in the midst of the age of curiosity and dawning social consciousness. The methods

of making the work in hygiene in these grades interesting and valuable will be determined accordingly. A little opportunity to observe something of the nature of bacteria should be given them in order that they may learn the principles of disease and contagion. Contests in fly and mosquito extermination will prove surprisingly fruitful of results. Some simple experimentation with foods and food preservation will be both interesting and profitable. Time and facilities for experimentation, however, are always lacking in the already overcrowded curriculum of our public schools, and the most practicable methods of giving instruction in matters of health and sanitation will be for this grade, as for the third and fourth, story-telling, extensive observation and reports and wide supplementary reading and discussion. These, if wisely ordered, and directed, may be made to appeal markedly to the elements of a dawning social sympathy and interest in the child.

Motive. The instincts of rivalry, inventiveness, constructiveness and sympathy; the natural social interests; dramatization and group activity will furnish the needful motivation for the work of these grades.

Time. A minimum of 50 minutes a week, with considerable time spent outside of school in observing and collecting data and in carrying out projects.

COMMUNITY HYGIENE for Grades 7 and 8.

Aims. The purpose of the work in hygiene teaching in the two upper grades should be to create in the child a strong and growing interest in the problems of neighborhood sanitation and health. The pupils in these grades have passed fairly beyond the age of individualism into the age of socialism. It is this which affords us a proper orientation for interesting them in the broader problems of citizenship. The emphasis now becomes altruistic, civic, communal.

While obviously a somewhat different course of study would have to be followed in the country from that applicable to the city, in general the topics suggested below should all find a place in the hygiene work in Grades 7 and 8:—

(1) Public markets.
  (a) Cleanliness.
  (b) Condition of foods offered for sale.
  (c) Foods exposed to insects, handling, dust, etc.
  (d) Appearance and habits of clerks.
(2) Sewage disposal.
  (a) Dangers from sewage improperly reduced.

(b) Study of local methods.
(c) Study of ideal methods.

(3) Garbage disposal.
(a) Necessity for co-operation on the part of every family.
(b) Study of local methods.

(4) Water supply.
(a) Principles of storing and filtration.
(b) Trips to local or nearby reservoirs.
(c) Essentials of a good system.
(d) House filters.
(e) Public drinking fountains.

(5) Boards of health.
(a) Duties and importance.
(b) Members of the local board.
(c) Is it an active or a passive one?
(d) Necessity for co-operation; individual responsibility in the health of everyone else.

(6) The fly problem.
(a) Its importance.
(b) Diseases carried by the fly.
(c) Survey of local stables and other breeding places.
(d) Methods of extermination.
(e) Construction of fly-traps.
(f) The responsibility of the home.

(7) The mosquito problem.
(a) Mosquitoes are both a nuisance and a danger.
(b) The conquest of the mosquito in tropical countries; in the Canal Zone.
(c) Survey of local breeding places.
(d) The responsibility of the home.

(8) Local disease.
(a) Study of vital statistics (local) in order to determine the most prevalent diseases.
(b) Study of possible common sources of these diseases.
(c) Crowded and overheated cars, theatres, stores, etc., as sources of illness in cold weather.
(d) The great white plague: the most fatal and disastrous of all diseases in America. What it is; how to prevent it.

(9) Hospitals and sanatoria.
(a) Their value to individuals and to society.

(b) Special neighborhood or near-by institutions: tuberculosis, isolation, etc.
(c) Is the number of hospitals and dispensaries adequate to meet all normal demands locally?

(10) Industrial and factory hygiene.
(a) The rights of the workingman to reasonable protection from disease and accident.
(b) Survey of local industrial plants and the work they are doing to conserve the health of their employees.

(11) Street cleaning and sprinkling and removal of snow.
(a) Importance to health of street sanitation.
(b) Improved methods.
(c) Duty of every abutter of keeping the walks in front of his home free from snow and ice.

(12) Public buildings.
(a) Ventilation, plumbing, etc.
(b) Safety.

(13) Dumps.
(a) Surveys and reports of all local dumping tracts.

(14) Fire protection.
(a) Dangers from great conflagrations.
(b) Local preventive facilities.
(c) Loss through fires during preceding year.
(d) Importance of building laws, inspection of lighting, plumbing, etc.

(15) Parks and playgrounds.
(a) Value of recreation grounds to a city—both in money and in health.
(b) Local surveys.

Method. The work in hygiene in Grades 7 and 8 is designed to bring home to the pupils—most of whom will never receive further systematic instruction—the great lesson of co-operation in matters pertaining to the public health. To this end, any method which will encourage an attitude of personal responsibility in the pupils should prove an admirable one. Among such methods may be mentioned the local survey of public markets, buildings, theatres, factories, etc.; the study of taxation and the apportionment of its funds to the public health work; trips to near-by reservoirs, filter beds and preserves; the judging of local markets in percentages according to a prearranged scale; the study of local and state vital statistics; the organization of school boards of health, city governments, hospital staffs, etc.; and the frequent use of

slides, exhibits and other illustrative material. Constant use of the textbook in community hygiene should be provided for, as should also occasional opportunity for a brief study of yeasts and molds as related forms of bacteria, to the end that the general principles of infection may be the better understood.

Time. A minimum of 50 minutes a week in the classroom.

GENERAL SUMMARY. In the preceding course of study, as outlined, there is necessarily much overlapping from year to year. Real teaching of hygiene to boys and girls is so largely determined by incident and "psychological moments" that any suggested outline of procedure must of necessity lack strict co-ordination and progressiveness. Thus, it would not always be wise to discontinue the regular morning inspections with the beginning of the third grade. Nor would emphasis upon correct habits of posture in grades 3 and 4 result always in such permanent formation of these habits that no subsequent attention would need ever to be paid to them in higher grades. Again, it would be a serious mistake to delay all instruction in the problems of community sanitation until the 7th. and 8th. grades. The wise teacher will be always on the lookout for the psychological moment for driving home a health truth. For example, if a teacher had planned to devote the first week in March to talks upon the common drinking cup, it would be a great error for her to overlook instances of two or three children drinking from the same dipper in the first week in November. Or again, if her program called for first-aid lessons during the last week of April, it would be an equally great mistake for her to permit a boy on the playground to bandage a badly cut finger with a dirty handkerchief two weeks or two days before that date. The time to strike in health matters as in all other situations is when the iron is hot.

BIBLIOGRAPHY OF SELECTED REFERENCES. The following list of books will be found valuable as supplementary readers in hygiene. The writer has indicated in each case the grade or grades to which in his estimation the various texts are best adapted. The list is by no means complete, but each book listed contains much excellent material.

(1) Brown, Bertha M.
Good Health for Girls and Boys (Heath)
152pp. ill. Grades 5 and 6.

(2) Bussey, George D.
A Manual of Personal Hygiene (Ginn)
156pp. Grades 7 and 8.

(3) Coleman, Walter M.

A Handbook of the People's Health (Macmillan)
307pp. ill. Grades 6, 7 and 8.

(4) Coleman, Walter M.
A Health Primer (Macmillan)
189pp. ill. Grades 3 and 4.

(5) Conn, H. W.
Introductory Physiology and Hygiene (Silver, Burdett and Co.) 211pp. ill. Grades 5 and 6.

(6) Gulick Hygiene Series (Ginn and Co.) 6 Vols.
Vol. 1. Good Health. Grades 3 and 4.

(7) Vol. 2. Emergencies. Grades 4 and 5.

(8) Vol. 3. Town and City. Grades 7 and 8.

(9) Vol. 4. The Body at Work. Grades 6 and 7.

(10) Vol. 5. Control of Body and Mind. Grades 7 and 8.

(11) Vol. 6. The Body and Its Defenses. Grades 5, 6, and 7.

(12) Hutchinson, Woods.
Health Series. 2 books (Houghton Mifflin)
Book 1. The Child Day. 183pp. ill. Grades 2, 3, 4, and 5.

(13) Book 2. A Handbook of Health.
348pp. ill. Grades 5, 6 and 7.

(14) Hutchinson, Woods.
Community Hygiene. 310pp. ill. Grades 7 and 8.

(15) Jones, May Farinholt.
Keep Well Stories for Little Folks. (Lippincott)
140pp. ill. Grades 1, 2 and 3.

(16) O'Shea and Kellogg Health Series. (Macmillan) 4 vols.
Vol. 1. Health Habits. 216pp. ill. Grades 3, 4 and 5.

(17) Vol. 2. Health and Cleanliness. 301pp. ill. Grades 5 and 6.

(18) Vol. 3. The Body in Health. 324pp. ill. Grades 7 and 8.

(19) Vol. 4. Making the Most of Life. 298pp. ill. Grades 7 and 8.

(20) Overton, Frank.
General Hygiene. (American Book Co.)
377pp. ill. Grades 5, 6 and 7.

(21) Overton, Frank.
Personal Hygiene. (American Book Co.)
240pp. ill. Grades 4, 5 and 6.

(22) Ritchie, John W.
Primer of Sanitation. (World Book Co.)
196pp. ill. Grades 6, 7 and 8.

(23) Ritchie and Caldwell.
Primer of Hygiene. (World Book Co.)
184pp. ill. Grades 6, 7 and 8.

PUBLICATIONS RECEIVED

THE CADET MANUAL, by Major E. Z. Steever III, U. S. A. and Major J. L. Frink, U. S. A. Philadelphia, Lippincott, 1918. 317 pp. Ill. $1.50 net.

This interesting manual is designed as the official handbook for high school volunteers of the United States (H. S. V. U. S.), an organization which is now claimed to be national in scope. Its president is Hon. Newton D. Baker, Secretary of War. Its membership numbers some 20,000 boys, organized in over 20 regiments scattered throughout the country. The work has the sanction of the War Department, which last year detailed six officers and twenty non-commissioned officers of the Regular Army to aid in its propagation. "In the High School Volunteer Idea," says the foreword, "you have the simplest, most direct and effective plan yet devised for laying the foundations of a better citizenship. Utilizing the apparatus afforded by the high-school system, with its students in the most impressionable age of youth; utilizing the play and game instincts of that youth in combination with certain features of military discipline, and adding the stimulus of inter-school competitions and national organization, the plan affords an educational medium for teaching citizenship directly and brings the work of each high school out into the arena of national effort."

The H. S. V. U. S. provides for a minimum of five periods each week, each period about 45 minutes in duration. Two of the periods are devoted to physical training, two to military drill and setting-up exercises, and the fifth to theoretical consideration in conference with the instructor. The classes are organized into squads consisting of 8 boys, platoons consisting of 3 squads, and companies consisting of 2 platoons. Each squad has its cadet leader, selected competitively from the membership. Outside of the 163 articles in the Regulations, an appendix devoted to the methods of installing the system in any high school, and the 111 illustrations, the main body of the manual comprises 5 sections, as follows: (1) drill; (2) the rifle; (3) signaling and signals; (4) physical training (setting-up exercises); and (5) wall scaling and cadet shows.

Besides being a very attractive book, The Cadet Manual contains a great mass of military information and procedure well adapted to the natural interests of the high school boy This, too, without keeping always in the foreground the strictly military point of view. We should like the Manual still better if this viewpoint were even more obscured, for in our opinion any organization or any manual which is predominantly military in point of view or in aim should find no place in our school system.

THE HOSPITAL AS A SOCIAL AGENT IN THE COMMUNITY, by Lucy Cornelia Catlin, R. N., Director of Social Service Work, Youngstown Hospital, Ohio. Philadelphia and London, W. B. Saunders Company, 1918. 113 pp. Ill. $1.25 net.

The author's aim in this book is to furnish suggestion, guidance and inspiration to all medico-social workers, especially in the new field of

hospital work in the smaller cities. Scientific research in sociology and general social welfare has for the past ten years been educating the public to a realization of existing social conditions to an extent never before realized. Social work has become as scientific as medical work; the Russell Sage Foundation is the great social laboratory, as valuable to social workers as Rockefeller Institute or Phipps Laboratory is to medical science.

In short, "this is an age when philosophy and science are turning the microscope upon the causes of social sickness and maladjustment, as well as upon the microbes which are so responsible for physical ills. Indeed, the analogy between medical work and social work is very close. The social history of an applicant for aid includes personal and family history and present complaint; then symptoms are noted, including working ability of the wage earner, family harmony or discord, degrree of industry, immorality or drunkennes, poor management of money or family affairs, and many others. All these symptoms are brought out by the social worker's investigation, just as the physical symptoms of a patient are shown in the doctor's examinations. . . . . That hospital social service should have developed along with other philanthropic organizations is only a most natural result of the advance in science and medicine. The work grew out of its own needs, and now is recognized as one of the social departments, as necessary in the successful treatment of patients as almost any of the others in the hospital."

Among the topics developed in the volume may be mentioned: (1) The justification for the existence of social service departments in hospitals; (2) out-patient departments established on a social service basis; (3) correlation of this department with other social agencies; (4) the problem of the hospital child, and (5) the place of the hospital in public-health work. A considerable number of case records of the Youngstown hospital are incorporated in the book as illustrations of some of the good results obtainable through the efforts of a social service department in a modern hospital.

The volume is interestingly written, and the viewpoint of the devoted social service worker is maintained throughout. We gladly commend the book to any who are interested in this recent development in hospital social ministration.

SCHOOL AND HOME GARDENING, by Kary C. Davis, Ph. D., Knapp School of Country Life; George Peabody College for Teachers. Philadelphia and London, J. B. Lippincott Company, 1918. 353 pp. Ill. $1.28 net.

With the world's food supply in its present unstable condition, *School and Home Gardening* comes as a much needed contribution to the general subjects of children's gardens. Dr. Davis' ideal in the preparation of this volume was "to make it so full of hints and practical instruction for young people, teachers and parents that it would naturally result in the making of many good home gardens in both city and country." Planning the Garden; Garden Tools and Implements; Hotbeds and Coldframes; The Soil and Its Improvement; Irrigation and Drainage; Exercises with Soils; Cuttage, Grafting, Budding and Layering; The Growing of Vegetables; Garden Calendars for Northern and Southern States;

Insects, Diseases and Their Control; Agricultural Contests and Club Work; these are among the twenty-three chapters included in the book. The one hundred and sixty illustrations are timely and well selected.

HOME AND COMMUNITY HYGIENE, by Jean Broadhurst, Ph. D., Assistant Professor of Biology, Teachers' College, Columbia University. In *Lippincott's Home Manuals.* Philadelphia and London, J. B. Lippincott Company, 1918. 428 pp. ill.

This manual marks a happy medium between the sketchy, rambling type of text in home and community hygiene and the more technical volume designed primarily for the use of the student of medicine. Starting out with a readable discussion of bacteria and other micro-organisms it passes logically over into the realm of foods, their functions, compositions and principal adulterations. A rather full chapter is devoted to milk and its relation to diet. The home and community water supply, its sources of danger and methods of safeguarding it; modern investigations into the problems of ventilation; the disposal of sewage and refuse are three chapters especially well written and non-technical. The sections devoted to disease and infection, disinfection and quarantine, prevention and diagnosis are discriminating and wholesome. These are followed by chapters in general personal and community hygiene, comprising sections on schools, libraries, theatres, restaurants, soda stands, hotels, barber shops, etc., etc. The chapters on infant welfare, middle age, tuberculosis, industrial and occupational hygiene are timely, as are also sections on mental hygiene, military hygiene and vital statistics.

Professor Broadhurst has endeavored to present in this volume a popular symposium upon the subject of health and its enemy, disease. He has done this throughout without sacrificing a strictly sound scientific viewpoint. The science which teaches us how to preserve health lends itself with unusual felicity to popular exposition. Its main principles are simple and few in number. They involve on the one hand broad biologic principles which appeal strongly to all who are open to the absorbing interest of fundamental scientific laws; and on the other hand in their practical applications they reveal points of contact with the most searching problems of social and economic organization, problems of housing, of industrial hygiene, etc. The author of *Home and Community Hygiene* has discussed these principles in a peculiarly happy manner, and this *Journal* gladly recommends the volume not only to students of home economics and nursing but to the general reader as well who desires familiarity with the principles of health and health control.

THE TEACHING OF SCIENCE IN THE ELEMENTARY SCHOOL, by Gilbert H. Trafton, Instructor in Science at the State Normal School, Mankato, Minnesota. Boston, Houghton Mifflin Company, 1918. 288 pp. $1.30 net.

Not the least worthy in this most excellent textbook, or rather method book, in science teaching is chapter 14, on *The Teaching of Hygiene.* In

this chapter Professor Trafton has done two things, and done them well: (1) he has emphasized throughout the futility of the older teaching of *physiology* and *anatomy* to children; and (2) he has found the psychological viewpoint in teaching children the great, fundamental principles of health. With perfect confidence he characterizes hygiene as "the most important subject in the school curriculum," although he is minded to acknowledge that, in spite of its preëminent importance it is "one of the most neglected subjects in the curriculum." Denouncing the teaching of "hygiene" in the past as a failure, he accounts for its ill-success, as do we all, through the misplaced emphasis of *physiology*, the actual open dislike for the subject common among teachers, and the perennial lack of real textbooks as bases for instruction. Those sections in the chapter which deal with the aim and goal of hygienic teaching, and with psychological motivation in gaining the interest and co-operation of the pupils are well worth while. In the next chapter are enumerated and described several experiments in hygiene which should prove practicable for any school. In a later chapter suggested outlines for teaching hygiene in grades 7 and 8 are included.

THE SCHOOL AS A SOCIAL INSTITUTION, by Charles L. Robbins, Ph. D., Teacher of History of Education in the New York Training School for Teachers. New York, Allyn and Bacon, 1918. 470 pp.

Contains an excellent chapter on educational hygiene, entitled: *The School as a Protective Agency.*

A very obvious fact which has only gradually become plain to humanity is that the welfare of the State is inseparable from the conservation of childhood. Children are no longer regarded as the property of their parents, to be exploited as ignorance and family needs dictate. So great has become the concern of the State for its own future welfare that the protection of childhood has become a matter of universal legislative concern. Instead of depending on chance, philanthropy, the wisdom and affection of parents, or the operation of physical or economic laws, governments everywhere have come to take definite legislative measures to provide safeguards for childhood. Protection from vice and crime, provision for adequate education, safeguards against exploitation by parents or employers, prevention of cruelty, reduction of infant disease, care of childrens' health, and provision of suitable support are all matters in which the State has assumed the right to legislate.

The school, as the protector of childhood and defender of the State, wages continual warfare against ignorance and its attendant evils. It protects the children of the nation from exploitation through the application of compulsory attendance laws. Through the increase of intelligence and through the cultivation of moral ideals and habits it raises barriers against vice and crime. It assumes a part of the work of protecting the child and the State from the evils of premature employment, diseases and avoidable death.

AN INTRODUCTION TO CHILD PSYCHOLOGY, by Charles W. Waddle, Ph. D. Supervisor of Practice Teaching and formerly Head of the Department of Psychology and Education in the Los Angeles State Normal School. Boston, Houghton Mifflin Company, 1918. 317 pp.

The child study movement of two decades ago rendered perhaps its chief service to the science by directing the attention of students of education to the study of children, rather than to theories about children. From this older child study movement there has since arisen a newer genetic psychology which bases its work not only upon the direct observation of children but also upon biology, heredity, experimental pedagogy, and the newer results of the behavioristic viewpoint. The author has not attempted a complete treatise, inasmuch as hardly more than the foundation stones of child study have as yet been laid. The best of what the movement has contributed has been organized and the reader has been put in touch with the most significant of the literature on each phase of the subject. The point of view throughout is the modern biological. The first chapter is a digest of Payne's *Child in Human Progress* and serves to set off the modern attitude of society toward children in proper genetic perspective. The second chapter describes the methods of studying children; the third develops the biological background; the fourth is a scientific discussion of the instincts. Play, language and drawing are then selected for type treatment as representing three child activities with instinctive bases. The author then takes up the questions of heredity and environment as showing themselves in the moral nature of children and in juvenile delinquency—heredity, environment and the moral nature of children being the central subjects toward which the whole book has been leading. The general facts and principles of mental development, and some of the established laws for this, followed by a consideration of individual mental capacities complete the volume.

The volume has much to commend it to thoughtful students of childhood. The modern biological-behavioristic viewpoint, the frank admission of the impossibility of attempting to produce an exhaustive textbook in child study, and the consequent wise choice of material to be presented, together with a complete and careful selection of references by topics, and an unusually pleasing diction go to make the work undoubtedly one of the very few excellent manuals of child study available in English thus far.

Announcement

In compliance with a recent ruling of the Paper and Pulp Section of the War Industries Board, the JOURNAL will refrain in the future from sending out sample copies except when requests are received from prospective subscribers. For the present such examination copies, within limits, will be supplied. Obviously, since this publication is relatively a new one in the field of educational journalism, its chief means of coming to the notice of school authorities and administrators has been through the liberal circulation of sample copies. With this avenue of publicity closed, the JOURNAL would invite its growing number of friends and well-wishers to continue their gracious efforts in its behalf. A good word spoken for it, or a renewed and payed-up subscription, will be appreciated and thankfully acknowledged.

The American Journal of School Hygiene

VOL. II DECEMBER, 1918 No. 4

PUBLISHED QUARTERLY, IN MARCH, JUNE, SEPTEMBER AND DECEMBER

Edited by Lawrence Augustus Averill

with the assistance of the following contributing editors:
Professor William H. Burnham, Clark University
Professor Fletcher B. Dressler, George Peabody College for Teachers
Professor Lewis M. Terman, Leland Stanford Junior University
Dean Louis W. Rapeer, University of Porto Rico
Dr. C. Ward Crampton, Department of Education, New York City

OXYGEN AS A CONDITION OF NERVOUS FUNCTION

BY WILLIAM H. BURNHAM, *Clark University*

The neurone, made up of the nerve cell and its processes is the unit in the nervous system. The brain consists of millions of neurones. If by accident, or disease, or syncope, or constriction of the arteries, the flow of blood to the brain is stopped, the result, as everybody knows, is loss of consciousness. If we ask why the blood supply to the brain is an essential condition of mental activity, we must answer that it is largely so because the blood carries oxygen, and oxygen is an absolutely essential condition for the functioning of the neurone. Without oxygen the neurone ceases to function and ultimately dies.

First of all oxygen is essential for the functioning of the nerve cell, and the number of responses of the nerve cell per second within certain limits depends on the amount of oxygen supplied. Oxygen is necessary also for the functioning of the nerve fibre. (4)

"It was long supposed by modern investigators that the nerve fibre was incapable of fatigue; that it could function indefinitely; as a telegraph wire or the like. But the condition of this continuous functional ability is not its mechanical character and its freedom from chemical change, but the abundant supply of oxygen that it receives from the blood and the lymph. The nerve fibre is perhaps even more greedy for oxygen than the nerve cell, and in the old experiments that were supposed to demonstrate this immunity to fatigue it sucked up oxygen from the air of the

room where the experiment was conducted. If, however, the experiments are performed in a chamber where the oxygen has been exhausted, the response of the nerve fibre becomes intermittent, and after a time ceases altogether.

"A long series of investigations in Verworn's laboratory have had to do with the relation of oxygen to fatigue. In the earlier studies Verworn (18, 19) and his pupils showed that exhaustion of the ganglion cells is primarily conditioned by lack of oxygen. This raised the query whether the same might not be true for the nerve fibre. Ranke and Ewald anticipated this; and Von Baeyer in 1903 published the report of an investigation in which he succeeded in surrounding the nerve fibre with pure nitrogen in a chamber prepared for that purpose; and under these conditions, the nitrogen merely serving to exclude oxygen, he found that the nerve fibre soon lost its irritability, but recovered again when placed in oxygen. The conductivity of the nerve also ceased when it was surrounded with nitrogen, and recovered again when placed in oxygen.

"Oxygen is necessary, as shown by Fillié (6), when the nerve fibre is immersed in a normal salt solution. The only difference is that fatigue comes less quickly in this case, because to some extent the toxic products of metabolism are washed out by the salt solution. Immersed in either a gas or a liquid free from oxygen, the nerve soon loses its irritability and conductivity, but it recovers fully when oxygen is supplied again."

While Verworn's investigations have shown the need of oxygen for the functioning of the nervous system of vertebrates, more recently the studies by Baglioni (1) and Fröhlich (7) of the nervous system of invertebrates have shown that this too requires oxygen.

Fröhlich finds a relation between the need of oxygen in individual nerves and the velocity of nerve conduction. In the nerve of a frog, with a rate of conduction of 25 metres a second, the suffocation period is one hour; for the nerve of a cephalopod, with a rate of conduction of one metre a second, the suffocation period is four hours; for a nerve of the Aplysia Limacina, where the rate of conduction is only 4/10 of a metre, the suffocation period is eight hours; and in this mollusk the nerves need far less oxygen than the central ganglia. The slower the process of oxidation, the less the need of oxygen. The more rapid the oxidation and the rate of conduction, the greater the need of oxygen. It is fair to assume that in warm-blooded animals, where the rate is sometimes 100 metres per second, the need of

oxygen is proportionally greater. In the nerve of the human being the velocity of the nervous current is especially rapid. Recent investigations indicate that the excitation passes along the nerve with a velocity of 120 m. a second. This inference in regard to the relation between the rate of the nerve impulse and the need of oxygen is corroborated by the studies of carbon dioxide production. Tashiro (16, p. 112-113) finds:

"There seems to exist a close relation between the rate of nerve impulse and carbon dioxide production in the resting nerve, if one compares the corresponding nerves of different animals. The data for such a generalization must necessarily be cumulative. The limited data we have secured indicate that the nerves which give off more carbon dioxide in the resting state conduct the nerve impulse more quickly."

The central nervous system has far greater need of oxygen than the nerves, as is shown by a simple observation. If an animal dies from bleeding, after a few minutes the functioning of its nervous system ceases. All the functions mediated by the large brain cease, because it is especially dependent on oxygen. The animal neither makes independent movements nor does it react to a call or to mechanical stimulation of the cornea or mucous membrane of the nose. If we lay bare a peripheral nerve of this animal, however ,and stimulate it mechanically by cutting or by electricity, then we obtain, even half an hour after the bleeding, twitchings of the muscle innervated by this nerve. Thus the need of oxygen in the nerves must be far less than that in the central nervous system.

The need of oxygen varies in different parts of the central nervous system. In case of man, after great loss of blood, first of all consciousness is lost, that is, the nerve cells of the cortex cease to function; respiration, on the other hand, which is functioned by nerve cells in the medulla, continues.

Apparently there is a relation also between the direction of the nerve impulse and the need of oxygen. Tashiro (16, p. 112) finds evidence from many experiments of a relation between the direction of the nerve impulse and the carbon dioxide production. He says:

"If one takes nerve bundles containing only sensory fibres, which conduct the normal nerve impulse in a central direction, the portion of the nerve nearer the natural source of the nerve impulse (i. e., nearer the end organ) gives more carbon dioxide production in the unstimulated nerve. This gradient of chemical condition seems to determine the direction of nerve impulse.

Many experiments made on various kinds of pure nerve fibres enable us to generalize this by saying that the normal nerve impulse passes toward a point of lower carbon dioxide production."

Another way of indicating the relation between functional activity and the need of oxygen is to note the relation between irritability and carbon dioxide production. Tashiro notes "the fact that chemical reagents which modify the degree of excitability invariably modify the rate of carbon dioxide production in the same proportion. The chemical activity in the nerve fibre seems to determine the state of nerve excitability."

It is not necessary to add that oxygen is no less essential when supplied to the neurones by the indirect method of respiration and the circulation and the oxygenation of the blood in our bodies than it is when supplied directly to the nerve in our laboratory experiments. Apparently, within certain narrow limits, the greater the supply of oxygen, the more work can be done, and oxygen postpones fatigue and causes rapid recovery from fatigue.

Also with diminution of the supply of oxygen there is an effect on the functioning of the nervous system. A series of phenomena are due to this fact. On the decreased supply of oxygen, for example, rests in great part the so-called mountain sickness and the severe symptoms of disease observed in an airship if a height of more than 5000 m. is reached. These conditions are characterized by extremely great fatigueability; even after slight work the brain may cease to function and consciousness be lost.

In case of children, relatively more oxygen is necessary than in case of adults. How much more is needed is roughly shown by the relatively greater amount of CO^2 produced by children. For each kilogram of body weight in the adult, perhaps a third less CO^2 is produced than in case of the boy 10 or 12 years of age.

From a hygienic point of view it is instructive to consider the relation of functional activity to oxygen supply. It is worth while to recall the obvious facts. Some of them are as follows:

In the first place we are surrounded by oxygen diluted with nitrogen, and provided with a respiratory apparatus for appropriating this oxygen. In the second place the hemoglobin of the blood provides a suitable medium for storing and carrying oxygen to different parts of the body.

Mechanical similes are liable to be misleading; because in the bodily tissue processes of building up and breaking down are continually going on; but an illustration from one of our popular

textbooks (Ritchie, physiology, p. 148) will make the process of circulation more vivid:

"The way the oxygen is carried in the blood may be represented by comparing the blood to a stream, the red corpuscles to little boats in the stream, and the hemoglobin molecules to little jars in the boat. In the lungs a molecule of oxygen is placed in each of the jars, out in the capillaries of the body the oxygen is emptied out of the jars, and the little boat floats around to the lungs, where each jar is again loaded with a molecule of oxygen."

The vast amount of oxygen carried by the hemoglobin of the blood is obvious by considering the facts. The red blood corpuscles or erythrocytes as they are sometimes called, are very small, the smallness giving a distinct advantage in the absorption, carrying and delivering of the oxygen. These small blood corpuscles can be sent through very finely divided networks of vessels and brought close to the cells they are to supply. The number of red blood corpuscles in a normal person is from perhaps 5 million to 6 million per cubic millimeter, and the amount of blood has been estimated at 4 million cubic millimeters, thus multiply 5 million by 4 million, we get some 20 trillion, which represents the total number of erythrocytes.

The surface of these red blood corpuscles is the significant thing in the performance of their special function. They are flat in surface, the surface diameter being estimated at 1/3200 of an inch, and their thickness about 1/5 of this. The total surface of all of them has been estimated as being equal to four baseball diamonds or 3/4 of an acre.

Again recent investigations by Gottschalk (8, p. 531) indicate that a certain amount of oxygen is stored up in the nerve cell. He sums up the result of his study in part as follows: With equal times for rest the succeeding suffocation periods decrease in length the larger their number, that is, in other words, the first suffocation period is longest, and each succeeding one becomes less. The length of the suffocation period is proportional to that of the preceding period of rest, if the latter lies within the optimum time. With a higher partial pressure the ability of the nerve to take up oxygen is not increased. Only the rapidity of the appropriation of oxygen is increased.

Gottschalk's experiments show apparently: first, that the nerve takes up reserve oxygen in an oxygen medium; second, that the amount of reserve oxygen taken up is dependent on the time of rest; third, that after a certain time (which he calls an optimal time) the taking up of oxygen ceases.

During the resting of the nerve in oxygen no further increase of irritability occurs after from two to four minutes, but one must supply the nerves with oxygen for a longer period in order to obtain the maximum of the suffocation period that follows; hence it must be the fact that a certain amount of reserve oxygen is stored up. A small part of this reserve oxygen in the nerves is dissolved in the nerve fluid. The larger part is present probably in close chemical combination, similar, Gottschalk thinks, to what we find in the combination of oxygen in hemoglobin.

Since oxygen is so vitally essential for the functioning of the neurones it is not strange that nature has made threefold provision against any possible failure of this oxygen supply. In the first place there is always a certain amount of air left in the lungs, the so-called residual air, amounting to about 1500 cc. This residual air contains a large amount of carbon dioxide and yet a sufficient amount of oxygen to supply the blood. Second, is the rich store of oxygen contained in the hemoglobin of the blood, an enormous amount, as we have already seen. Third, is the reserve oxygen stored up in the nerves themselves. Thus with this threefold reserve oxygen supply, there is always enough to supply the needs of the neurones even in spite of a temporary environment of the most impure air or a temporary diminution of the oxygen in the blood, or even perhaps a temporary cutting off of the blood to the nerves, although this lack could continue only the briefest interval.

Thus nature provides many safeguards in the human organism and many means of compensation or defense. But that these safeguards are insufficient for more than a temporary cutting off of the external supply of oxygen is shown by the phenomenon of mountain sickness and the extreme discomfort that one experiences in going to a very high altitude. Apparently this may not be due to the mere difficulty of breathing, and the like, caused by the increased amount of CO^2 in the lungs, and the need for greater ventilation of the lungs, but also to the lack of oxygen supply to the blood.

Fatigue, or inability to function, may be due either to lack of nutritive material, or to the accumulation of toxic products or to both. Now oxygen represents an essential part of the nutritive material for the nerve cell; and the poisons that affect the nerve cell are not only the various toxins that result from the functional activity of the nerve cell itself, but various other poisons as well, either manufactured in other parts of the body or taken into the body in some way. What is the significance of the various toxic

products formed? What effect do they have on the nerve tissue? There are two theories.

The first is that held by Verworn and his school (20). Winterstein some years ago experimented with various narcotics, ether, alcohol, chloroform, and carbon dioxide, to determine whether the nerve centers of the cord when fatigued will take up oxygen during narcosis. All the experiments showed that no recuperation occurred, and thus the first proof was given that living tissues during narcosis are unable to utilize oxygen when offered to them. Verworn and others studied the effect of narcosis on the nerves. The sciatic nerve of a frog was asphyxiated and thus made greedy of oxygen. When it was completely fatigued; that is, when its conductivity was lost and its irritability reduced to a low level, it was narcotized with ether. Then during narcosis, oxygen was supplied to it for a long time. In such experiments made by Verworn, Fröhlich, and others, there was never any trace of recovery; but after the narcosis was stopped and the nerve surrounded with air, it recovered in one minute showing normal irritability and restoration of conductivity. Ishikawa also experimented with amoebae which had been asphyxiated in pure nitrogen and found that they do not take up oxygen when supplied to them during narcosis, but after stopping the narcosis and supplying air they rapidly resume the amoeboid motion. Verworn maintains that "These experiments show unequivocally that living tissues, even when their demand for oxygen has been raised to an extreme degree by fatigue or asphyxia, cannot, during narcosis make use of oxygen, even when offered to them abundantly."

Heaton (10) has shown also that the breaking down processes can be increased during narcosis by stimulation. He narcotized two sciatic nerves of a frog under identical conditions. One remained at rest, the other was continually stimulated by a faradic current applied to the end outside the chamber. After stopping the narcosis in pure nitrogen it was always found that the irritability of the stimulated nerve has fallen to a lower level than that of the other. On the basis of these and other experiments Verworn (19, p. 63) formulates the following statement:

"Living tissue becomes asphyxiated during narcosis. The katabolic phase of metabolism continues in the form of a non-oxidative destruction, just as in asphyxia, and can also, as in asphyxia, be accelerated by exciting stimuli. Recovery from this asphyxia is, as in every asphyxia, only to be attained by supplying oxygen."

All the experiments bearing upon narcosis seem to show that the effect of narcotics is to induce acute asphyxia of the cells. In narcosis nervous irritability sinks in a few minutes to a point which it only reaches in pure nitrogen in two or three hours. But the more rapid or slow onset of depression is solely dependent on the rapidity with which the oxidation processes are abolished. And so Verworn sums up the matter as follows:

"It seems to me that, after these considerations, it is no longer possible to doubt, not only that narcosis is accompanied by asphyxia, but that the acute asphyxia is the deciding factor which produces the depression. This does not exclude the possibility that the narcotic may also produce other changes in the living matter, for instance changes in the state of aggregation of certain substances. Whatever other changes may occur, the factor which produces the characteristic symptom complex of narcosis is under all circumstances the suppression of the power to carry on oxidation."

Thus according to Verworn the effect of different poisons is to cause a degree of asphyxiation in the nerve cells which decreases or destroys altogether the ability of the cells to appropriate oxygen. As the old proverb has it, we may lead the horse to water, but we cannot make him drink; so in a condition of narcosis we may supply the neurones with oxygen, but we cannot make them appropriate it.

Another theory is that the anaestehtics make the semi-permeable plasma-membranes of the neurones more resistent to changes in permeability, and thus reduce their ability to respond to stimulation. This has recently been expressed by Professor Lillie (13, p. 961) in part as follows:

"Another condition producing effects resembling anaesthesia is lack of oxygen. This retards or arrests activity in many cases; e. g., the nerve cells of vertebrates are very susceptible to lack of oxygen; nerve trunks, on the other hand, are relatively insusceptible. Cell-division—e. g., in developing egg-cells—usually ceases if the oxygen supply is insufficient. Contractile activities are decreased or abolished. Many organisms, however, show only slight immediate effects; this is true of many Protozoa; Vorticellae, for instance, remain contractile for some time after simple removal of oxygen from the medium, although they are at once paralyzed by anaesthetics. Such facts oppose the view held by Verworn and others, that the anaesthetic acts primarily on the oxidative mechanism of the cell. It is true that the rate of oxidations in active tissues is lowered during anaesthesia, but this

effect is rather a consequence than a cause of the lessened activity. Obviously wherever free oxygen is necessary to the normal activities of a tissue its withdrawal will arrest those activities. But the effects produced by lack of oxygen are not to be identified with anaesthesia because of such incidental resemblances."

"To sum up—it would thus seem that anaesthetics produce their essential effects by modifying the properties of the semipermeable plasma-membranes of the irritable tissues, making these structures more resistant to changes of permeability than normally. Since variations of permeability are essential to stimulation, the irritable tissue is thus rendered temporarily insensitive or irresponsive." (13, p. 970.)

Without attempting to judge between these opposing theories, it should be noted that in any case the effect of the narcosis or anaesthesia is to reduce or destroy the ability of the cells to respond to stimulation, so that for hygiene it does not apparently matter which theory is correct. We see also that in any case oxygen is an essential condition of nervous function, and that lack of oxygen arrests function. We may note some of the different ways in which the oxygen supply to the nerves may be reduced. The most obvious of these, such as the breathing of bad air, and the like, are apparently the least important; and the more subtle and unobserved means of reducing the oxygen supply, or of arresting the ability of the nervous tissue to utilize the oxygen that is furnished in normal response to stimulation, are the most serious.

1. AIR DEFICIENT IN OXYGEN. Although perhaps of minor importance, the continuous breathing of air deficient in oxygen may reduce the oxygen supply. Nature has surrounded us with oxygen diluted to a most favorable mixture for appropriation by the human organism. But we shut ourselves up in small pools of air, and the oxygen supply is diminished by the respiration of the occupants of any enclosed space. Recent experiments have shown, however, that this diminution has no appreciable immediate influence, because however much the oxygen may be decreased, under ordinary conditions there is still an ample supply for the needs of respiration.

More serious is the effect when the amount of oxygen is reduced by going to a high elevation as in climbing a high mountain, or the like. Here the reduction of the oxygen supply is so great that it causes serious discomfort, so-called mountain illness, and the like.

2. DEFECTS OF CIRCULATION. The supply of oxygen may be diminished by anything which interferes with the blood supply to the brain, disease, nasal obstructions, bad posture, or the like. Again the amount of haemoglobin in the blood may be diminished by extreme fatigue or the like, and thus the supply of oxygen to the nerves may be seriously diminished. In all of these ways the amount of oxygen carried to the nerves may be diminished.

3. CARBON MONOXIDE. Especially noteworthy is the effect of certain poisons in decreasing the amount of oxygen carried by the blood. The serious effects of inhaling air vitiated by carbon monoxide, for example, are well known. This may come from defects in the heating apparatus or the lighting apparatus.

In any case this carbon monoxide is very greedy for oxygen and combines with the oxygen in the haemoglobin of the blood so that the amount of oxygen carried by the blood is directly decreased, and this is probably often of serious significance even when the amount is not sufficiently great to cause obvious symptoms that would altogether incapacitate one for doing work.

Parenthetically, the deadly effects liable to result from the escape of the water gas used in many cities may be noted. If you smell escaping gas in your laboratory, or your room, remember it is not a mere question of the possibility of a sufficient amount to cause asphyxiation, but of a deadly poison that you are inhaling. Dr. Sedgwick (15) has recently called attention to the enormous number of deaths resulting from this in the State of Massachusetts.

There was, if I mistake not, a law in this state before 1885 which forbade the use of water gas. But in that year a law was passed making its use permissible. The data in regard to the results of using such gas I take from Dr. Sedgwick's paper.

Before the year 1885 there had been only four deaths in twenty years. After the law was passed in 1885 authorizing the use of water gas the death rate increased rapidly, 1200 lives being lost in Massachusetts up to the time Sedgwick wrote and probably many more since that time. In Massachusetts and Rhode Island the death rate from gas poisoning nearly equals the death rate from scarlet fever and diphtheria, and in some cities has caused as many deaths as has typhoid fever. "Even more serious are the public consequences of the widespread distribution to sick and well for industrial and domestic purposes of a dangerous and highly poisonous substance, insidious in its mode of operation, quickly harmful in its effects, and delivered under such pressure that leaks are frequent."

Thus probably the most dangerous of all agents in reducing the oxygen supply is the pressure of carbon-monoxide in the air breathed, a subtle poison, whose presence may scarcely be detected.

4. TOXINS. The power of the nerves to carry on oxygenation may be interfered with by toxins of various kinds. Verworn's studies of narcosis seem to show that in such states the condition is one of asphyxiation, the nervous substance is unable to appropriate oxygen. How far this is true we do not know, but it seems probable that either in this way or by their effect on the permeability of the membranes the toxins retard function. Toxins which may have this effect on the nerves are produced in several different ways, among them the following:

1. Is the toxin contained in expired air. That there is such a poison in expired air seems now to be experimentally established. The old experiments by Brown-Sequard and D'Arsonval were many years ago shown to be defective, and repetition of these experiments by Bergey (3) and others gave negative results. Then it was long supposed that there was no organic poison in expired air. But the recent experiments by Professor Rosenau (14) at Harvard have apparently proved that the expired air contains a proteid. Whether or not this exists in such quantities in the expired air as to have any appreciable influence upon health in an ordinary room remains to be determined, but Professor Rosenau and others have a strong suspicion that such may be the fact, and that this in part may account for the unpleasant effects of bad air.

2. Are the toxic products from functional activity itself. The existence of these has been amply demonstrated, and whenever they are produced in sufficient quantities actual narcosis of the nervous tissue may result. Kraepelin probably exaggerated the facts, but he chose his language wisely when he said many years ago that pupils in the schools are often in a permanent condition of narcosis from fatigue.

3. And perhaps most common and serious of all are the toxic products from the various forms of indigestion which produce narcosis of the nervous tissue; and, especially among persons who lead a sedentary life, intestinal indigestion and the like are very common, and many individuals seem never to be free from a certain degree of poisoning from this source. By this means the oxygen supplied by the blood is made in part useless, the nerve tissues cannot appropriate it, and functional activity is retarded or made impossible.

4. Are the various products used as narcotics and the like. If it can be avoided, nothing is more foolish than to take a narcotic to put one to sleep. As seems to have been sufficiently shown by Verworn, the sleep produced by drugs is not like normal sleep, it does not produce a period when the anabolic processes preponderate over the katabolic, but on the contrary there is depression of the oxidation processes in the fatigued ganglion cells during such sleep. It is sometimes wise to use hypnotics in order to reduce a constant excitation of the cells, so that sleep may ensue afterward; but what is really done is to cause a deeper condition of depression, which is afterward followed by recovery during normal sleep.

From this point of view which shows the vital importance of oxygen for the functioning of the nervous tissue, we can see the significance of the different conditions essential for efficient brain activity. Blood circulation, nasal breathing, correct posture, and the like, are all important, because they permit the normal supply of blood, which is the carrier of the oxygen. Again an optimum temperature is of prime importance, because with too high a temperature the normal metabolism is interfered with. This is shown in extreme form in the heat depression of sunstroke or the like. The supply of oxygen is not sufficient for the increased metabolism brought about by the temperature. For a similar reason it is probable that an excess of humidity, at least such as occurs during the muggy days of summer, interferes with metabolism, and that here again the depression is due in part at least to the lack of a sufficient supply of oxygen to the tissues.

As we have seen, oxygen is necessary both for the nerve cells and for the nerve fibers. Without oxygen both are subject to fatigue. The number of responses in the nerve cell is correlated within certain limits with the amount of oxygen supply; and again the amount of oxygen needed is correlated with the rapidity of the oxidation processes. In asphyxiation oxygen quickly brings recovery; and in conditions of fatigue oxygen hastens recovery. And finally, without oxygen nerves die of suffocation.

PRACTICAL SUGGESTIONS.

We may now consider briefly some of the practical questions for school hygiene and the hygiene of study. Many investigations bearing upon the effects of bad air have been made in

recent years. Most of the old ideas have been exploded. Many of the recent studies seem to show that bad air even in the worst ventilated rooms has little effect upon the health of the occupants, provided the temperature and humidity of the room are not too high.

Many recent studies have indicated that the CO^2 even in the worst ventilated rooms does not appreciably affect the health, neither does the decrease of oxygen directly affect the working ability, except within possibly very narrow limits, neither have organic poisons in expired air been shown to have an appreciable effect on the health of the individual. It is rather the high temperature and unfavorable humidity and probably several more obscure factors that cause the discomfort in unventilated rooms; and these because they interfere with metabolism.

Of the studies that bear more directly on the amount of intellectual work that can be done under unfavorable conditions of the air, one of the most important would seem to be that made by the commission formed for the study of ventilation in New York City under the auspices of the Metropolitan Life Insurance Company. The full account of these studies is not at hand, but the results as reported indicate that the condition of the air had little or no effect upon the amount of mental work that could be done. Even excessive humidity failed to show significant effects.

"Elaborate psychological tests of color naming, naming opposites, addition, cancellation, mental multiplication, typewriting and grading specimens of handwriting, rhymed couplets and prose compositions, all failed entirely to show any effect of even the severe 86°—80 per cent relative humidity condition upon the power to do mental work under the pressure of a maximal efficiency test." (22, p. 628.)

Hasty inferences should not be made from such results of experimental investigation. The evidence from general observation and experience is distinctly to the contrary. In schools and factories, and the like, where many workers are brought together it has been found that much more work is done with good ventilation than without it. Reports like that by Dr. Councilman, are significant. He stated a few years ago that in the new buildings of the Harvard Medical School the students in the laboratory keep fresh all day long and are able to do more work than under the unfavorable conditions of ventilation in the old building, and general observation corroborates such reports. From our present point of view we see that in judging of the unhygienic effects of bad air upon those doing intellectual work, we

should look deeper and instead of considering merely the temporary effect upon the workers consider the influence of such conditions upon metabolism and upon the store of oxygen in the haemoglobin of the blood. Unfortunately few studies bearing directly upon this have been made.

The studies based on the observation of children in the practical work of the schools, however, are significant. Mr. Woodruff made an important contribution to the Washington Congress of Hygiene and Demography in 1913 (24) in which he reports an investigation of fresh air classes in New York City made by him in his capacity of physician to the outdoor classes of the Board of Education. He says:

"When a class as a whole tell me that have had no colds all winter long—something outside of the previous experience of any of them, I know that somehow or other their general resistance is raised; and when a teacher tells me, as one did, that her children on coming to her were so listless at the end of the day that she had to give them work requiring concentration in the morning, and that after three or four months their condition was so changed that they became progressively more alert as the day advanced and took the hardest work just before 3 o'clock, then I know and we all know that the physical conditions of these children has markedly improved."

"With a lack of proof of the relationship between poverty and anaemia, and the results in our non-feeding classes we feel that poorly nourished and anaemic children even from poor homes, can be placed in the fresh air in school and without school feeding and kept there during the cold of winter, not only without physical injury, as shown by their maintenance of nutrition during the year, but with actual benefit to them, as indicated by the marked increase of haemoglobin in the very anaemic and the general gain in mental and physical tone, with which all of us in our outdoor class work are familiar."

Some studies have now been made in regard to the mental work of children in outdoor schools showing often that they do better than children indoors. This result again is due apparently to the general improvement in health and the better supply of haemoglobin that results rather than to the immediate effect of the outdoor air. One such experiment has recently been reported from the Horace Mann school. Mr. Upton (17, p. 32) reports:

"Mental tests indicating progress in the usual schools subjects were also given . . . 'in formal English the third grade outdoor class not only had higher averages than the indoor class, but

improved 20% whereas the indoor class improved only 13% during the year.' In arithmetic the outdoor class improved 20% against 6% for the indoor class.''

The publications of the New York Commission have had some unfortunate results. Many people seem ready to jump to the conclusion that bad air is not a significant matter and that waste of heat by open windows is unpardonable.

From our present point of view we see how rash are such hasty inferences. Probably, to take an illustration, a person in a room where there is a small amount of carbon monoxide in the air would do just as much mental work temporarily as in another room where there was no carbon monoxide, and yet in the former case, as we have seen, most serious results would occur. Thus, for all we know, the continued working in bad air and in overheated rooms may affect metabolism and constantly decrease the amount of hemoglobin.

A very important investigation, made recently by Dr. S. Josephine Baker of New York City (2) on classroom ventilation and respiratory diseases, suggests such an effect. This invesitgation concerned 5,533 pupils in 76 classrooms in 12 schools furnished with three different types of ventilation, and was conducted during a five-month period in the late fall and winter and early spring.

The result gave no evidence that the relative humidity in the rooms whether ventilated by natural or mechanical means was a causative factor in the occurrence of respiratory illness, but it did show that children in classrooms with closed windows and ventilation by mechanical methods were more subject to respiratory diseases, both those severe enough to keep them out of school and those not sufficiently severe to keep them from school attendance, than the children in classrooms kept at the same or lower temperature and ventilated wholly by open windows. Dr. Baker says:

''1. In the closed window, mechanically ventilated type of classroom kept at a temperature of about 68 degrees F. the rate of absences from respiratory diseases was 32 per cent higher than in the open-window, naturally ventilated type of classroom kept at the same temperature (about 68 degrees F.) and about 40 per cent higher than in the open window, naturally ventilated type of classroom kept at a temperature of about 50 degrees F.''

''2. In the closed window, mechanically ventilated type of classroom kept at a temperature of about 68 degrees F. the rate of respiratory diseases occurring among pupils in attendance was

98 per cent higher than in the open window, naturally ventilated type of classroom kept at the same temperature (about 68 degrees F.) and about 70 per cent higher than in the open window, naturally ventilated type of classroom, kept at a temperature of about 50 degrees.''

It is especially important that nothing in the surroundings during intellectual work should decrease or destroy the haemoglobin. We have already seen that the presence of carbon monoxide in the air, whether due to escaping water gas or to methods of heating, is distinctly and seriously injurious to the haemoglobin. It would not be strange if further investigations should show that continuous work in conditions of bad air also has a result in decreasing the amount of haemoglobin. It is especially significant that intellectual work itself seems to have this effect.

''MacDonald (4) showed that the breathing of children during brain activity becomes shallow, and he concluded that the lessened oxygenation of the blood stands in direct relation to the difficulty of the mental work. Perhaps the most interesting experiments are those of Graziani, who tested the influence of school work in a long examination period on the blood. Graziani's subjects were university students and children of the fourth and fifth elementary classes. The observation of the blood was made first in case of all subjects at least a month and a half before the examinations began; that is, at the time when preparation for them had not yet begun, when, therefore, at least a normal amount of mental work was being done and the strain has not yet reached that degree which immediately preceded the examinations. The tests for comparison were usually made some days before the examinations. Times when the subject was in a period of nervous excitation were carefully avoided. Both tests were made always in the forenoon at nearly the same hour, so that always similar conditions as regard rest and the taking of food might be obtained.

''Graziani's (4 and 9) results were as follows: At the first test he had 18 university students and 17 children of the fourth and fifth classes, but of these at the second tests only 10 students and 12 children were available. It is noteworthy that all subjects had suffered great loss of weight, which varied between 2 and 10 kilograms, and an average of 3.9 kilograms per hundred of body weight. As regards the number of blood corpuscles, the results do not agree. In some cases the number is decreased; in others it is increased, and it is impossible to draw any conclusions in regard to the significance of these variations. On the

other hand, the lessening of the amount of haemoglobin is noteworthy. In all subjects this was observed, with an average decrease of about 10 per cent. And the resistance of the red corpuscles was increased, a fact which points in the same direction.

"In tests made by Graziani of children of four and five years of age in the elementary classes it was found that the only noteworthy and constant difference between the first and the second tests concerned the content of haemoglobin. The diminution of this amounted on the average to 7.4 per cent. The body weight was sometimes slightly decreased; sometimes it showed a slight increase. Considering the fact that all the subjects were in the period of development, it is clear that an increase in the case of all subjects was to be expected.

"Especially interesting were the results which Graziani found in experiments on himself and on a small servant in the hygienic institute, an intelligent 12-year-old boy. In order to be sure that the changes that occurred were actually conditioned by extreme brain work and not dependent on other causes, such as change of habit, difference in the time of the year, etc., it seemed desirable to determine whether intensive mental work for a period of some hours exercised an influence on the number of blood corpuscles, etc. For several hours Graziani busied himself with a kind of work that was new and fatiguing to him, consisting of a long series of arithmetical computations. He worked at this so long that he actually felt himself incapable of continuing the work. Likewise, he had the boy do the same work, and permitted an interruption of it only when he had repeatedly declared that he was tired, and he seemed to be no longer in a condition to continue the work.

"The test of the blood was made the first time immediately before the beginning of the work, and the second test immediately after finishing the work.

"The variation in the number of red corpuscles was not significant, but the decrease of the amount of haemoglobin was noteworthy. In the case of Graziani himself the average decrease was 7.5 per cent, and for the boy about 8 per cent."

These investigations indicate that mental work may have a significant effect on the reserve oxygen in the blood.

CONCLUSION.

The results of recent investigations have apparently confused the ideas of many people in regard to the need of

ventilation. It is true that investigations have shown that the CO^2 present even in the worst ventilated rooms is not harmful. As a matter of fact, CO^2 in the blood, in the residual air of the lungs, and in the air we breathe, is essential for the life and health of the organism. It is true also that scientific investigations fail to show any volatile organic poison in expired air that necessarily has an injurious effect upon human beings. The investigations of the New York Commission on Ventilation failed even to find any significant effect of a considerably increased temperature and increased humidity on the ability to do mental work, but we should be slow to make practical inferences in regard to ventilation from such results. The whole matter, as suggested by what has already been said in regard to the necessity of oxygen, is far more complex than ordinarily supposed. Since nature has provided the three-fold reserve supply of oxygen in the alveolar air, in the haemoglobin of the blood, in the nerve cell itself, it is not strange that the brain is able to function just as well temporarily under adverse conditions as regards the atmosphere. But the real question is how such adverse conditions affect the reserves of oxygen, especially the haemoglobin of the blood, the appropriation of oxygen by the nerve cells, and the general metabolism.

From the investigation of the New York Commission itself, we find a suggestion that conditions of bad air do have an effect, probably, upon metabolism; for the one positive result of their study was the fact that the workers under unfavorable air conditions show loss of appetite. The question that should further be investigated is in regard to the effect of continuous work under such conditions upon the haemoglobin of the blood and upon metabolism in general.

Again, the question of the various toxins produced by the work itself or taken into the body from outside should be considered. Immunity to the toxic products of fatigue may be acquired, but for all we know the oxygen of the blood may itself be an anti-body to fatigue and this is suggested by the fact that there is some indication that small quantities of fatigue toxin have a different effect from large quantities. Lee found reason to believe this to be the fact and Ishikawa in his experiments on the amoeba found indication that the first effect of a narcotic on the amoeba is stimulating. All these things suggest the great complexity of the whole matter and the need of studying the subtle effect of toxins.

Some of the most important points may be summed up briefly as follows:

1. Oxygen is an essential condition for the functioning both of the nerve cell and of the nerve fibre.

2. Both the nerve cell and the nerve fibre are subject to fatigue, they recover more rapidly when supplied with oxygen.

3. The various poisons, not only chloroform, ether, and other narcotics, but perhaps also the toxins of fatigue and indigestion, decrease or destroy the ability of the nerve cells to respond to stimulation.

4. Oxygen is necessary for the neurones, not only because it supplies nutrition, but also because it oxydizes the toxic products of metabolism transforming them into substances that are harmless or easily soluble in the blood.

5. An adequate supply of oxygen is an essential condition for the functioning of the human brain. As shown by the old experiments of Speck, the brain strikes work when the amount of oxygen in the air is less than 8 per cent. But while the slight reduction in the amount of oxygen in an unventilated room is not sufficient by itself to have an appreciable effect on the functioning of the brain, the continued breathing of bad air probably interferes with metabolism and reduces the store of oxygen in the blood.

6. The effect of oxygen as a condition of efficient brain activity is dependent apparently on two things:—on the one hand, the supply of oxygen to the neurones, on the other hand, the ability of the nerve cells to appropriate the oxygen that is supplied, an ability reduced by various toxins.

7. In considering the ill effects of working in unventilated rooms, the effect of such conditions on metabolism and the haemoglobin of the blood should be considered rather than the temporary effect upon the individual.

8. In the questions of practical school hygiene one of the most important rules is provisions for an optimum temperature and humidity, and one of the greatest evils in American school rooms is the usual condition of overheating that is prevalent in many parts of the country.

BIBLIOGRAPHY.

1. BAGLIONI, S. L'eccitabilita diretta dei centri nervosi agli stimoli artificiali. Zeit. f. Allgemeine Physiologie, 1901. Vol. 10, p. 87-136.
2. BAKER, S. JOSEPHINE. Classroom ventilation and respiratory diseases among school children. Amer. Jour. of Public Health. 1918, Vol. 8, p. 19-26.
3. BILLINGS, J. S., MITCHELL, S. W., and BERGEY, D. H. The composition of expired air and its effects upon animal life. Smithsonian Inst. Washington, D. C. 1895. 81p.
4. BURNHAM, WILLIAM H. Oxygen supply as a condition of efficient brain activity. Journal of Educational Psychology, 1911, Vol. 2, p. 421-428.
5. FELDMAN, J. and HILL, L. The influence of oxygen inhalation on the lactic acid produced during hard work. Jour. of Physiology, 1911, Vol. 42, p. 439-443.
6. FILLIE, H. Studien über die Erstickung und Erholung der Nerven in Flüssigkeiten. Zeit. F. allgem. Physiologie, 1908, Vol. 2. p. 492-511.
7. FROHLICH, F. W. *Experimentelle Studien am Nervensystem der Mollusken.* Zeitschrift f. Allgem. Physiol. 1910. Vol. X, p. 384-436, and Vol. XI, p. 94-114, p. 121-140, p. 141-144.
8. GOTTSCHALK, ALFRED. Erstickung und Erholung des markhaltigen Kaltblüternerven. Zeit. f. Allgemeine Phys. 1913-14, Vol. 16, p. 513-534.
9. GRAZIANI, R. Der Einfluss der übermässigen Geistesarbeit auf die Zahl, auf den Hämoglobingehalt und auf den Widerstand der roten Blütkörperchen. Zeitschrift für Schulgesundheitspflege, 1907, Vol. 20, p. 337-353.
10. HEATON, T. B. Zur Kenntnis der Narkose. Zeit. f. Allgemeine Physiolcgie, 1910. Vol. 10, p. 53-62.
11. HILL, L. and FLACK, M. The influence of oxygen inhalation on muscular work. Jour. of Physiology, 1910. Vol. 40, p. 347-372.
12. HOUGH, THEODORE. The primary purpose of ventilation, to facilitate the maintenance of the constant temperature of the body. 4th Int. Congress on School Hygiene, Buffalo, 1913, Vol. 2, p. 248-255.
13. LILLIE, RALPH S. The physico-chemical conditions of anesthetic action. Science, 1913, Vol. 37, p. 959-971.

14. Rosenau, M. J. Preventive medicine and hygiene. Appleton, New York, 1913.
15. Sedgwick, W. T. Illuminating gas and the public health. The Harvey Lectures, Lippincott, Phila. 1911-12. p. 100-129.
16. Tashiro, Shiro. A chemical sign of life. Univ. of Chicago Press. Chicago. 1917. 142p.
17. Upton, S. M. H. Open-air schools. Teachers College Record, 1914, Vol. 15, 67p.
18. Verworn, M. Irritability. New Haven, Conn. Yale Univ. Press. 1913, 264p.
19. ——— Narcosis. Harvey Lectures, Philadelphia, Lippincott, 1911-12, p. 52-75.
20 Veszi, Julius. Die physikalisch-chemische Theorie der Narkose. Pflüger's Archiv für die gesamte Physiologie. 1918, Vol. 170. p. 313-336.
21. Warburg, O. Uber die Empfindlichkeit der Sauersstoffatmung gegenüber im differenten Narkotika. Archiv f. Physiologie, 1914, Vol. 158, p. 19-28.
22. Winslow, C. E. A. Standards of ventilating in the light of recent research. Science, 1915, Vol. 41, p. 625-631.
23. Woodman, A. G. and Norton, J. F. Air, water and food from a sanitary standpoint. N. Y. John Wiley. 1914, 248p.
24. Woodruff, I. O. Fresh air schools in New York City. A comparative study. 4th International Congress on School Hygiene, Buffalo, 1913. Vol. 2, p. 80-90.

LABORATORY METHODS IN SCHOOL HYGIENE*

BY J. H. BRINCKER, M. A., M. D., D. P. H.

Clinical and bacteriological laboratories for diagnostic purposes are, in these days of rapid advance, an essential in every general and special hospital, and many hospitals now have laboratories in charge of skilled and expert workers, provided with the necessaries for diagnosis and serum treatment. Where similar laboratories exist under Public Health Authorities, they are of more recent origin. The first Municipal Pathological Laboratory in this country was at Bradford in 1902, and comparatively few have the equipment or staffing usual with the hospital provision. Of recent years this state of affairs has much improved, more especially since the statutory provision of medical inspection of schools.

The *rôle* played by these two classes of laboratories differs somewhat, for whilst both have the common aim of confirmation and accuracy of diagnosis, in the case of the hospital the ultimate object is provision of treatment, which in most cases means the preparation of vaccines, whilst on the other hand the municipal laboratory strives for prevention of disease.

A note on some of the methods of the public health laboratory may therefore be of use to many of our school workers.

The main object of diagnosis in this laboratory is to prevent the spread of disease, but incidentally the question of advice regarding treatment must not be forgotten.

For prevention, rapidity is desirable, and therefore the methods used have to be those most quickly completed, and also methods which permit a number of examinations to be carried through at the same time. The methods adopted have always to follow the rule of being simple, quick, and reliable.

The materials most commonly submitted have in view diagnosis of the commoner diseases in school life, in children especially living the greater part of their time in large communities, with the restrictions and confinement involved.

These materials may be classed as relating to—

(i) Skin conditions including vermin, scabies, ringworm, and favus.

*Reprinted from "School Hygiene (English) Oct., 1918.

(ii) Throat conditions, including diphtheria and other forms of sore throat, thrush, Vincent's angina, and under certain conditions the meningococcus.

(iii) Ocular inflammations, such as *Ophthalmia neonatorum,* and other forms of ophthalmia, septic, gonococcal, pneumonic, or due to such organisms as the Koch-Weeks, Morax-Axenfeld, or diphtheria bacilli.

(iv) Nasal or aural discharges, which may be either primary or secondary in relation to the disorder.

(v) Cerebro-spinal fluid, especially for diagnosis of cerebro-spinal fever, pneumococcal, or tubercular meningitis.

(vi) Expectoration in suspected cases of tuberculous disease.

(vii) Samples of milk, for tubercle, etc.

(viii) Samples of urine for chemical alterations, or infections, such as tuberculosis or parasites like *Schistosomium hæmatobium.*

Skin Conditions.

(1) *Ringworm of the scalp.*—Three types of ringworm are common (*a*) the commonest in children, the small-spored variety due to *Microsporon audouini.;* (*b*) the *Trichophyton megalosporon* of Sabouraud, or large-spored ringworm subdivided into an endothrix and ectothrix variety according to whether the fungus is in or outside the hair.

The small-spored variety is responsible for 90 per cent. of English ringworm cases. It is rarely parasitic after puberty, and may be taken not to affect adults. This is important, as teachers at times claim to have contracted this disease in school work. The small-spored form is the variety most refractory to treatment, and is that which is behind all the chronic forms of ringworm daily met with, and is also often responsible for the intractable cases of scurvy heads often mistaken for "only scurf." It seldom causes baldness, but generally presents patches with broken-off stumps, easily epilated, and covered also with longer, apparently healthy, hair. The importance in treatment of these patches is to look for minute secondary or even tertiary patches of recently-infected scalp. Owing to the distribution of the disease, and the danger associated with chasing the disease round the scalp with inunctions, it is now generally accepted that the only effective treatment is by complete epilation of the scalp by X-ray treatment. This leaves a hairless surface, and on this any small, rough patch of the disease is obvious, and can be treated with success by mild antiseptic ointment.

The large-spored varieties are more amenable to treatment, and generally of quite limited local distribution.

The endothrix has a tendency to produce baldness, the affected hairs breaking off flush with the scalp, and showing up as a black dot on the skin. They must be looked for and removed by forceps, for diagnostic purposes; or a small piece of scale is often found to contain a hair fragment when removed and examined.

The ectothrix, although easily cured, is said occasionally to cause ulceration and scarring, and has the reputation of being associated with domestic animals. An outbreak in London in one school and family was traced to ringworm in a cow kept by the children's parents.

For diagnostic purposes, the school doctor or nurse, who is responsible for the supervision and treatment of minor ailments, is directed to make a careful survey of the child's head, and, by the help of a hand lens and forceps, to remove reliable specimens of broken hairs and stumps. The inexperienced nurse will sometimes send quite normal hairs. These specimens are placed in a small piece of smooth white paper; this is folded and enclosed in a suitable small envelope, which is sealed and labelled with name of child and school department, dated and signed by doctor or nurse. Sent to the laboratory, it may be examined at the same time as fifty others, so care must be taken not to confuse specimens. Each one is handled separately and a microscopic preparation made. Suitable stumps being selected, are placed on a labelled slide in a drop of B.P. solution of caustic soda or potash. A cover-glass is placed on it, and the slide held over a small flame sufficiently long to expel any air. The specimen is then examined with a two-third inch, and, if necessary, any selected portion can be looked at with a higher power, such as a sixth of an inch objector, in order to decide as to any question of the kind of fungus seen.

In small-spored ringworm, there are a very large number of spores of all sizes; often mycelial threads show up, and the hair looks worm-eaten. It is this last eroded condition which makes the hair so fragile and brittle.

In the endothrix variety the hair is packed with strands of cubical spores, which causes the hair to appear a tightly-packed hollow tube. This also makes the hair near the follicle very weak, so that it breaks off flush.

In the ectothrix there are strands of rounded or cubical spores enlaced about the outside of the hair which looks like a garlanded pillar. Very few spores are formed inside the hair, and in this

variety there is not the same tendency to break off short, but, as the fungus involves skin and follicle, the hair falls, and the follicle is often permanently destroyed.

No true mycelial threads appear in either form of the large-spored variety.

The morphological differences of the fungi show up if they are grown on the specially prepared media containing maltose known as Sabouraud's medium.

Favus.—A fourth variety of fungus, the *Achorion schonleinii,* produces favus. This disease, as described in clinical records, may be a rare occurrence, but it is quite common as a chronic disease of the scalp among the population of alien origin in Eastern and North-eastern London, judging from its frequency in specimens sent up to the laboratories. Formerly many scores of cases were recorded annually, now the new cases do not exceed the score.

Microscopically, the main features of the favus hairs are: (1) The absence of spores; (2) a mycelial mass encircling the hair at about the level of the mouth of the hair follicle; this mass is termed the "collar." It is noted in nearly every specimen submitted. (3) The length of the infected hairs which do not break; (4) they contain much broken-down oily material, giving a beaded appearance to the hair; (5) a diagnostic sign of great importance is the occurrence of the so-called "favus tubes" running in the length of the hair. If the hairs have been placed in potash solution and gently heated, on cooling under the microscope oily globules may be seen during cooling to be siphoned along these tubules. A specimen of favus once seen and diagnosed under the microscope, the observer never has any further difficulty in differentiating it from the other fungi already described.

Where these fungi affect other parts of the skin, scrapings taken with a sharp knife, without wounding, mounted in liquor potassæ and examined, show the characteristic fungi. Other species also affect the skin, but are too rare in our schools to require special consideration here.

Inflammatory Conditions of the Conjunctiva.

Acute inflammatory conditions in the eye and appendages may be due to a generalised systemic infection, as in measles, or to microbial infection from without. It is the latter which is of laboratory importance.

Infections by the gonococcus, especially in the newly-born. Although infection by pnuemococcus and *Bacillus coli* are ob-

served, *Ophthalmia neonatorum* is almost entirely due to infection of the conjunctiva by maternal gonococci. It is a most dangerous condition as regards permanent damage to vision or even blindness. In microscopical examination it is only necessary to gently squeeze open the inner canthus of the eye, removing some of the secretion on a sterilised wire loop, which is then drawn across a clean slide. Two such slides are generally prepared. The first is after drying through the flame, stained for a minute with Loeffler's alkaline methylene blue, the older this is the better. The slide is carefully washed in running water, excess of water shaken off, and the slide allowed to dry. It is then examined directly by a twelfth of an inch oil immersion objective. If gonococci are present they will be found collected in numbers, five or more, in an epithelial conjunctival cell. The gonococcus is a fairly large kidney-shaped diplococcus. The second slide is stained by Gram's method, but, instead of counter-staining with eosin solution, it is advisable to use a very dilute solution of carbol fuchsin. The gonococci are found not to retain the Gram stain.

Blight.—The form of ophthalmia common to elementary schools is generally known as "blight" or infective ophthalmia. It is very contagious through expectorations from mouth and nose, and also in discharge running from the eye. Thus one eye is easily infected from the other, and it is spread by towels, handkerchiefs, or other fomites used in common. It is generally taken as due to a staphylococcus, which has become highly "virulised." Children suspected to be suffering from this disease should be rigorously excluded, and kept out of school, until quite cured. From the very start active antisepsis should be adopted to prevent spread. The disease has a tendency to extend rapidly through a department, especially when flies are prevalent.

Trachoma, or "granular lids" is uncommon in England. The discharges from the eyes are intermittent but contagious. Muller's "trachoma bacillus," associated with the influenza group of organisms has been assigned, but it is not generally accepted, as the cause of the disease.

Diphtheria of the conjunctiva is not an uncommon occurrence. A false grey membrane covers the conjunctiva, and this is a serious disease in its results.

Micro-organisms resembling *B. Diphtheriæ,* as, for instance, the *B. xerosis,* are of quite common occurrence but little importance.

Other varieties of conjunctivitis.—Cases of conjunctivitis occasionally occur from which other varieties are obtained, as for instance:

In cases of acute contagious conjunctivitis due to a small bacillus, the Koch-Weeks, morphologically resembling the influenza bacillus but differing culturally in that it is not obligatory hæmophyllic, growing well on serum agar. This form of acute conjunctivis has been found common in Egypt.

In cases of chronic contagious conjunctivitis, or angular conjunctivitis or dry conjunctivitis, a small diplobacillus is often identifiable, called the *B. lacunatus,* or after its discoverer, Morax-Axenfeld bacillus. It grows readily in blood-serum, producing a characteristic picture in twenty-four hours; the serum is digested and liquefied in a series of deep pits with sharply defined margins, hence the name *B. lacunatus.*

The pneumococcus is also occasionally responsible for epidemics of acute conjunctivitis.

SORE THROATS.

Sore throats, including the common sore throat and common colds form a large and somewhat vague subject. A sore throat is an inflammatory condition of the mucous surfaces of portions of the nasopharynx, larynx, or nasal cavities, and unless directly due to chemical or traumatic outside agency, is invariably the result of specific micro-organisms.

The sore throat of interest to the laboratory worker is a definite infection. This aspect of the suject is neglected by the laity, who look upon it as a mere nothing, move about among their friends with it, and benefit the public by passing on "a mere cold" to some, serious disease to others.

Sore throas and tonsillitis are very common occurrences in populous communities, including children, and at present soldiers, who are herded together, and amongst whom infections readily spread. They are more common in the fall of the year and during fine wether, probably due not to excess of dust, but changes in the immunity reactions of the body. The unseen enemies are ever ready to attack. This is demonstrated by the "colds" which Actic explorers contract as soon as they return to civilization. Methnikoff's explanation of this occurrence is the basis of his phagoctic theory of the white corpuscles. Most of us have to suffer such attacks to obtain immunity. Many micro-organisms may produce the infections and cause very different

results in different people. "At the last day, two will be found in the field, and one will be taken." So with the attacks of disease germs. On one it will fall harmlessly, for the second it may be severe, dangerous, or even death may follow.

Again, all epidemics of infection seem to begin mildly, with cases differing markedly from the common type. In scarlet fever, diphtheria, influenza, or cerebro-spinal fever, where sore throat is a prominent and early symptom, it may be the only symptom. These cases are usually of short duration and mild, rapidly recover, rejoin the community, and still infections are proportionately dangerous. Whilst a sore throat may not mean much to the affected person, it may in a few days be of the greatest importance to the community.

Sore throats must, therefore, all be considered as gravely suspicious. An affected child should be excluded, isolated at home (preferably in bed), and watched for two or three days to see what may develop, otherwise a fleeting rash, or fleck of membrane may be missed, and the nature of the disease not recognised. Many causes are not yet recognisable by laboratory methods; for instance, scarlatina and rheumatism cannot yet be reliably differentiated thus, whilst sepsitic, diphtheric, or meningococcic causes should be recognised.

Micro-organisms differ not only morphologically but also physiologically; they have preferences for environment and soil to grow upon. Some require oxygen, the obligatory aërobes, whilst others are indifferent—the facultative aërobes—and some cannot grow in its presence—the obligatory anaërobes. Some require a trace of acid, others will be prevented growing by a trace of alkali.

The bacteriologist must therefore have clinical aid to narrow the scope of his inquiry.

The old method of using a "swab" of sterilised wool with material from the throat placed in a sealed tube, and sending it to the laboratory has been given up. It was crude and the results unsatisfactory. In the case of the delicate meningococcus, reduction below the body temperature and drying meant its death before it reached the laboratory.

The more scientific way is to use a platinum loop or soft iron wire to take up some discharge, and directly inoculate a culture tube of the medium with the material. The investigator, supplied with tubes and wires, sterilises a loop in a spirit flame, allows it to cool, applies it gently to the right tonsil or soft palate, or both, then transfers it to the tube, and carefully strokes the surface of

the "medium" held in the left hand with the loop of wire drawing the streak along the side of medium nearest himself. The loop is sterilised again and material taken from left tonsil and a parallel streak made to the first. A third sterilising and material taken through each nostril from the posterior nares is inoculated as a third and then fourth streak. The tube is then plugged with sterile wool, and incubated at 37° C. Care must always be taken to sterilise all wires after as well as before use. After twelve to eighteen hours the tube is examined. A skilled bacteriologist, with aid from a hand lens, will be able to recognise or suspect the colonies which have developed.

If it is diphtheria he is looking for, he would select a suspicious-looking colony, pick it up with a wire, transfer it to a small drop of water on a slide, break it up in this, and with the wire spread the fluid as a film along the slide. Parallel to this film he will select other colonies from each of the four streaks on the medium, and thus make four film-streaks on the slide. When dry, this film is stained by a suitable differential stain for one to two minutes, drained, washed, and allowed to dry.

For diphtheria various compound stains, which have to be carefully made, are in use. The most common are Loeffler's methylene blue, Neisser's stain, and the one now generally used, toluidine blue, with a small fixed proportion of acetic acid. This gives differential staining of the parts of the bacillus which separates it from the micro-organisms, morphologically very like the *B. diphtheriæ.*

It requires long training to acquire skill to avoid the many pitfalls which surround the bacteriologist, and in the health laboratory he must have also a useful working knowledge of the epidermiology of disease, to co-ordinate all the facts he observes in regard to occurrence and distribution as well as variety of cases.

In the case of a single individual with sore throat, before definite clinical signs can be used, the investigator may have to begin his inquiry as to the nature of the sore throat. The patient is examined, swabs taken, and then advised to go home and stay indoors till a diagnosis has been made. The school doctor always carries the necessary material, a few tubes, a platinum loop, and lamp for this first inquiry. Blood-serum is the best medium to be at hand.

The next commonest inquiry is as to the prevalence of a certain disease in a community, whether that be a school, classroom, or residential school. A number of cases of illness of the same disease has occurred in this one localised community within a defi-

nite short period of time. The disease has been spread through some definite cause or agency, and it is the duty of the investigator to inquire into all likely causes of the spread of the disease, including the "history" of the cases as they have occurred. This requires a fairly comprehensive knowledge of the laws which underlie the epidemiology of disease.

It may be stated at the outset that in order to inquire and determine the causes of the spread and distribution of infectious disease and so prevent it, requires an investigation of the outbreak in definite epidemiological lines.

A want of appreciation of this fact leads to hopeless confusion, inability to stave off the outbreak, and usually ends in a confession of failure by school closure. This interpreted means, "I have made a hopeless mess of this job, partly owing to my ignorance, partly owing to my want of appreciation that disease follows certain regular rules, so let us draw a curtain over this hopeless confusion by closing down."

If the outbreak is one (like diphtheria) in which the exciting cause is known to be a specific bacillus, the epidemiological investigation may be materially aided by taking a sampling of the class or department and swabbing them. In this way any persons harbouring this bacillus, and thus acting as a source of spread, may be detected, excluded from school and dealt with by means suited to eradicate the infection.

The selected sampling of the class should not be children taken at random, but those selected for a definite reason after careful inquiry. They would include—

(1) Children recently recovered from the disease.

(2) Children who have recently suffered from some suspicious symptom or symptoms associated with the disease, and therefore may in all likelihood have been suffering from a mild but unrecognised attack of the disease.

(3) Children who have had a sore throat or a cold.

(4) Children who are suffering from unhealthy, chronic conditions of throat, nose, ears, or skin; they include those with nasal and aural discharges.

(5) Children who come from homes or institutions where the disease is known to have existed.

All these persons are known at certain times to be carriers and so conveyers of the disease to others susceptible to the disease.

(6) Finally, there is a group of persons not included in the above groups, as yet undefined, who may for variable periods, often for years, but only at certain intervals carry and convey

the germs of infection. They are generally known as *chronic* or *intermittent carriers* of the germs of infection.

When diphtheria or scarlet fever has occurred in a classroom or department, a certain number of carriers are generally discovered in an investigation of this kind. The percentage of carriers vary, but is generally held in these diseases to be about 5 per cent.

Having discovered a number of carriers in our sampling, the classroom is watched, and if no further cases of the disease arise, it is held that the carriers of disease have all been discovered and excluded, so that there is no further risk of infection.

This is not true. The explanation is that the cause of the spread of disease depends mainly on two factors: firstly, the degree of immunity existing in a certain community B; and, secondly, in the intensity or density of the infecting agent naturally existing in this community. If they are balanced, no cases of the disease will occur, even if the intensity of the infection may be high; but if a person is introduced into this community B from a community A, when the immunity is of a lower par than in B, this person A is sure to fall a victim to the intensity of virulence of the disease.

Diphtheria carriers are never absent from a good many London schools, yet no cases of the disease may occur for some years; then for some reason or other the intensity of infection is increased above par and cases of the disease occur; first, only as cases of sore throat, then as mild cases; but as the intensity is heightened so the cases become more severe and the number increased, and this increase occurs along a definite and well-known epidemiological curve. In the same way, for some reason, the natural standard of immunity in the community may fall and the intensity of infection becomes relatively increased and illness results. These are reasons for believing that this is the cause of the usual autumnal invasion of scarlet fever and diphtheria.

A HEALTH EXAMINATION AT SCHOOL ENTRANCE

BY LAWRENCE AUGUSTUS AVERILL
Editor of The American Journal of School Hygiene.

This is a phase of real educational procedure that we in America have studied very little. It is interesting to note, however, that in England and on the Continent—from which places we have largely received all example and precept for educational hygiene in this country—there have been in operation for several years various plans for beginning health training in earliest infancy, rather than to wait for the entrance to school. So far in America our line of effort in this direction has lain in the establishing of milk stations and baby-weighing centres where parents might buy pure milk for their babes, or where they might receive more or less expert advice from nurses or philanthropic citizens in charge in the bringing up of their infants to be physically sound. As communities, however, we have done practically nothing for promoting the health of children between one year of age and the time of their entering school.

It is a fact well established in the English investigations as well as in the German that it is not until the second year of life that incipient defects begin to make their appearance, and that preventive measures taken during the first year tend rather to insure that the infant shall live to grow up than that it shall be subsequently free from physical disorder.

Dr. David Forsyth, Physician to the Evelina Hospital for sick children in London called attention several years ago (*Pediatrics,* 1913) to "the widespread physical deterioration that overtakes children during the first four or five years of life," and concluded that "the conditions cannot adequately be met by postponing action until the children reach the minimum school age, by which time much suffering and not a little permanent damage will have been inflicted."

The city of Westminster (England) in January, 1912, opened a medical inspection centre for children under school age which, through the coöperation of the public health authorities and with the help of a staff of health visitors, was able to get into touch with every family into which a new child was born. As was designed, the centre very soon had under observation the entire under-school-age population of the district, the aim being to keep

every child under medical supervision from the time of its birth until the end of its fifth year, "and then to hand it over sound and healthy to the school authorities, together with the medical record of the material facts in its life for the school doctor."

To quote from Dr. Forsyth's paper:

"...Altogether 374 children have been examined, excluding reinspections. Of these, 131 were under 1 year of age, 77 under 2 years, 83, 50 and 33 under 3, 4 and 5 years, respectively. The outstanding feature of an analysis of the medical record cards is the rapid rise in the tide of disease with each year of life. For, while the large majority of the children in the first period are found to be healthy, only a small minority come through to their fifth year without at least one physical defect of some kind or another. This is most strikingly seen in cases of dental caries, a condition which is, probably, responsible for more ill health among children than any other. The increasing percentage of these cases in successive years is shown in the table below. It should further be added that, as a rule, the more advanced the age, the more extensive was the disease. A very similar rise is seen both with enlarged tonsils and with adenoids, while the proportion of these cases in urgent need of surgical operation increases yearly, indicating, of course, the aggravation of the condition when left untreated. With rickets, on the other hand, the incidence reaches a maximum in the second year, thereafter rapidly declining; this disease, therefore, so often the cause of lifelong deformity, has inflicted its damage long before school age.

"Altoghether the 374 children presented 332 defects. In addition, the feeding of a large proportion of the cases in the earliest years required some modification, great or small, and, in almost one-half the cases under 1 year old, needed revision one way or the other. The table following, showing the percentage of children affected in each year, summarizes the incidence of the most important defects.

Physical Defects of 374 Children Examined, By Ages.

	Under 1 year	1 year	2 years	3 years	4 years
Teeth	....	2.6	18.1	34.0	63.6
Tonsils . . .	....	7.8	16.9	24.0	26.9
Adenoids . .	1.5	10.4	22.9	38.0	33.3
Rickets . . .	13.0	25.9	9.6	8.0	3.0
Diet modified	49.6	22.8	6.0	....	....

"The practical conclusion from the point of view of prevention and curative treatment hardly needs stating. Suffice it to say, there is no reason to suppose that the children examined at the centre differ materially from other children of their class, at any rate in urban areas, and it is highly probable that, as similar inspection centres are organized elsewhere, the results will be, in the main, similar to those in Westminster. In other words, large numbers of children, healthy in all respects at birth, become within five years the physically defective entrants whom the educational authority is required, at no small cost, to restore, so far as possible, to their original state of health. Yet most of these cases are preventable, or, if taken in time, can be remedied more speedily, and therefore more cheaply, than if left until school age, by which time not a few will have received permanent damage—physical or mental. The problem of the defective child largely resolves itself into the problem of the under-school-age child, and seems hardly likely to be solved by any scheme short of a national one insuring to all children regular supervision from birth to school age. And this, to be fully successful, must run side by side with educational measures for instructing the mothers themselves who, from ignorance far more than from wilful neglect or even from indigence, are unable to safeguard their children's health."

In general those defects which, according to the findings of such investigators as Forsyth and Winch in England and Thiele and Steinhaus in Germany, have already fastened themselves upon pre-school children include diseased conditions of the teeth; enlarged faucal and adenoid tonsils; rickets and other complications arising from malnutrition; myopia; hardness of hearing, resulting from various throat affections, and pre-tubercular symptoms all of which defects, as every physician knows, are easily remedied if taken in time. A thorough physical examination at school entrance would discover the presence of any of these and thus determine the exact condition of the child's health and his ability to enter upon the work of the school. "What," asks Burnham, "could be more inefficient than our present haphazard method of beginning school work without determining whether or not pupils are fit for school occupations?" Dr. Burnham would go further than the mere physical examination, and have the inquiry include not only the physical condition of the child but would also have it embrace a test for mental age, thus determining whether the child is of average intelligence to start with, or whether far below it—or perchance well above it. The future problems of placement in the grades or in special classes would

thus be partially solved at the very beginning of school life. If need be, Dr. Burnham would recommend a sort of health year for beginners, in which chief if not entire emphasis would be laid upon the physical improvement of defective children as the only foundation upon which the real work of the school may be safely built.

It is, then, undoubtedly true that, instead of blaming the school for the alarming incidence of disease and defect to be found increasingly up through the grades, we have none to blame but ourselves and our failure to start soon enough in our campaign of child conservation. In the past we have been content to allow every child at the completion of his sixth year to enter school, utterly regardless of physiological age and physical fitness. Then, not only have we found in our schools physically handicapped children in every grade, but also school authorities have year after year reported percentages of retardation often as high as 15%. Essentially speaking, the term "retarded pupil" in a grade should be a misnomer, for with proper initial school entrance examinations, both physical and psychological, it should be possible at the outset to place children almost without exception in the proper grade, school and class. Children mentally or physically inferior would be weeded out and either placed in corrective classes or else in special classes for fixed defectives. The perennial drag upon our school system of thousands of these misfits has reached a point where reform is becoming essential. Either discover, diagnose and correct the physical irregularities which inevitably predispose them to the backward, retarded group, or else, if correction is impossible, put them into ungraded classes. Most cities now conduct these special classes, but it is an unfortunate fact that under their present organization they often fail to include among their numbers all, or even nearly all, children of similar limited capacity to be found in the public schools. It is doubtless also true that they include not infrequently scores whose physical disabilities might have been overcome if taken in time, and who should be now doing good work in regular classes. The present waste of time and effort on the part of grade teachers about whose necks hang these educational millstones is enormous. The whole work of the school is hampered by the presence in it of those children who, because of mental inferiority, should never have been permitted to enter, and by that of those whose bodily condition should first have been carefully diagnosed and ameliorated.

Neither in training for the pursuits of war nor the pursuits of peace would such lax methods of organization be countenanced. In both of these branches of effort, particularly in the latter, original selections are rigorous; characteristics meriting promotion must be positive; rejects must spend a period in the fields in order to bring their health up to an irreducible minimum; men obviously below the standard are placed in special limited service; the great mass are sufficiently sound to begin drilling at once. Applied to the public school the same business methods would require the examination rigorously of all applicants for entry to school; would reject temporarily those physiologically inferior; would reject unconditionally those obviously unable to do the work of the school, and place them in special classes; while the great mass would be admitted to the public schools as satisfactory beginners.

Is there any good reason why we should be more strictly business-like in making soldiers than we should in making citizens; or in building up a military machine than in building up a civic machine? Efficiency in the one is not less essential than efficiency in the other.

But it is not enough that we subject every child upon the completion of his pre-school life to a rigorous medical examination, for defects and infirmities are often so fixed in children by that time that they either fail entirely to respond to corrective treatment, or, as in most cases, they respond very slowly, and as a consequence children thus physically unsound are handicapped in their school work throughout their entire first years of attendance. Psychologists have pointed out long since the extraordinary mental and physical strain which the unaccustomed life and surroundings of the school cause children to undergo during the first few months in which they are striving to make the necessary adjustments. Even for the most robust and capable child, the curve of growth often follows a plateau level during the first year of school life, so new and strange are the stimuli pouring in upon him. Consequently, the nervous system of every child should be fortified to withstand the new experiences of school life and school influence. And in order to guarantee such an optimum physical condition, it is an unwise policy which bids us wait even until the time of entrance before examining the prospective pupil.